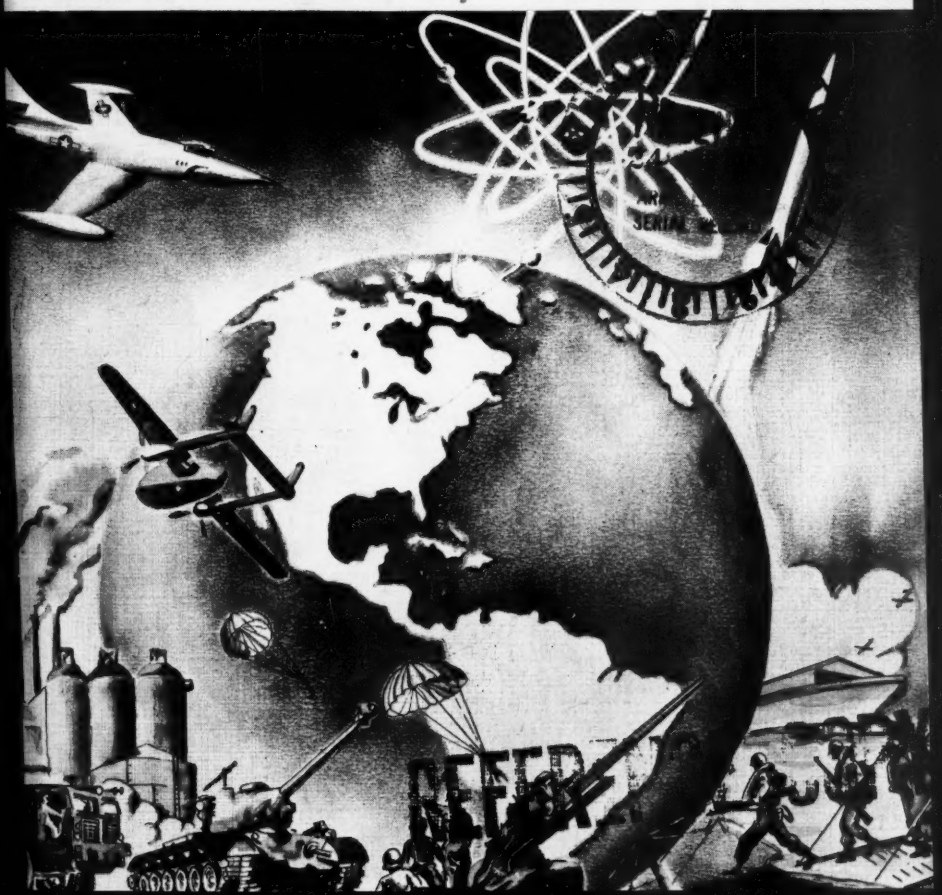
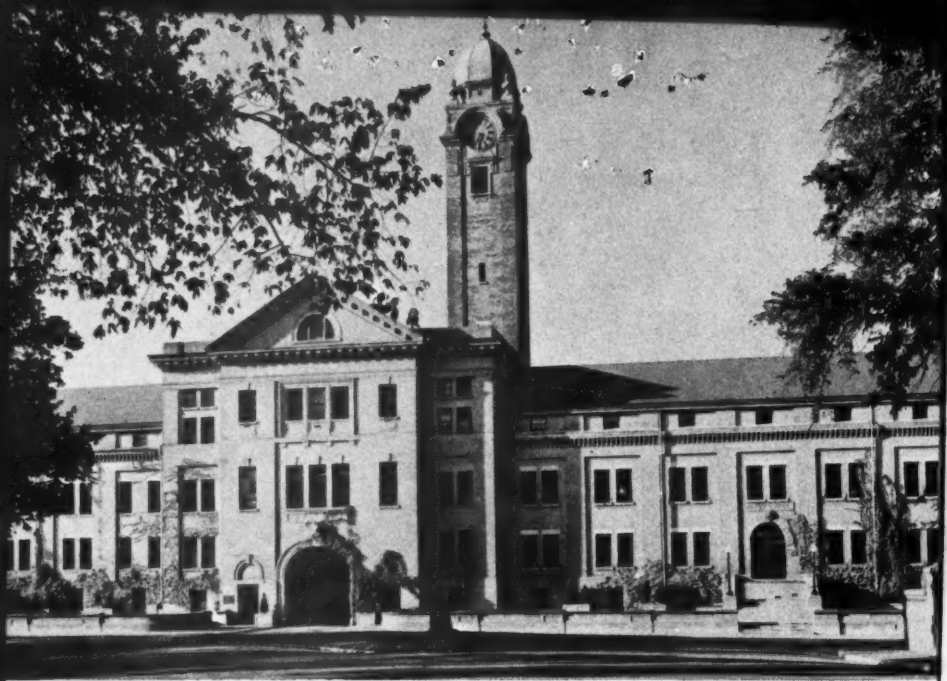
MILITARY REVIEW



COMMAND AND GENERAL STAFF COLLEGE
FORT LEAVENWORTH, KANSAS

APRIL 1953 VOLUME XXXIII NUMBER 1



COMMAND AND GENERAL STAFF COLLEGE

COMMANDANT
MAJOR GENERAL H. I. HODES

ASSISTANT COMMANDANT
BRIGADIER GENERAL MAX S. JOHNSON

EXECUTIVE FOR INSTRUCTION
COLONEL J. W. COUTTS, *Infantry*

EXECUTIVE FOR RESEARCH AND EVALUATION
COLONEL E. C. DOLEMAN, *Infantry*

SECRETARY
COLONEL J. M. LAMONT, *Quartermaster Corps*

CHIEF OF STAFF AND DEPUTY POST COMMANDER
COLONEL T. B. HEDEKIN, *General Staff*

MILITARY REVIEW

VOLUME XXXIII APRIL 1953 NUMBER 1

CONTENTS

MILITARY REVIEW—Published monthly by the Command and General Staff College at Fort Leavenworth, Kansas, in the English, Spanish, and Portuguese languages. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1879. Subscription rates: $3.50 (U.S. currency) a year in the United States and other countries of the Western Hemisphere: $4.50 a year in all other countries.

OUR AUTHORS

Colonel Herbert A. Jordan is the author of "Practical Aids to Logistic Planning," which appeared in the June 1952 issue of the MILITARY REVIEW. A short biographical sketch of him also appeared in that issue.

Lieutenant Colonel Charles H. Waters graduated from the United States Military Academy in 1936. During World War II, he served as the commander of the 1158th Engineer Combat Group in the United States and the European theater. In 1946, he attended the Command and General Staff College. In 1951, he attended the Armed Forces Staff College, Norfolk, Virginia. He is presently serving with the Management Division, Office of the Comptroller of the Army.

Major Pierre P. Kirby served in the European theater during World War II as a rail transportation officer. From 1950 until 1951, he served in Korea with the 21st Infantry Regiment, 24th Infantry Division. He is presently attending the Advanced Course at The Transportation School, Fort Eustis, Virginia.

Major Louis E. Long served as S3 of the 779th Tank Battalion, 12th Armored Division, during World War II. Since the war, he has served in the G3 section, Headquarters, Third Army, and the G3 section, Japan Logistical Command. Since 1951, he has served as an instructor at the Command and General Staff College.

Lieutenant Colonel Charles E. Welsh served in the European theater during World War II as commander of the 76th Field Artillery Battalion. He was separated from the Army in 1945 and returned to active duty in 1946. In 1948, he served as Associate Professor of Military Science and Tactics at the University of Hawaii. He graduated from the Command and General Staff College in 1951, and is presently serving as an instructor at that College.

Doctor Constance McL. Green was a history instructor at Mount Holyoke College and Smith College prior to World War II. During World War II, she served as the historian for the Springfield Armory in Massachusetts and subsequently joined the staff of the War Department's Historical Division. Since 1951, she has been the historian for the Research and Development Board of the Department of Defense.

Colonel Paul L. Bates commanded the 761st Tank Battalion in the European theater during World War II. He graduated from the Command and General Staff College in 1950, and from the Strategy and Tactics Course, Naval War College, in 1952. He is presently serving as an instructor at the Command and General Staff College.

Lieutenant Colonel Arthur J. DeLuca served with the 13th Airborne Division in the European theater during World War II. From 1945 to 1948, he served in the Office, Assistant Chief of Staff, G2, Department of the Army. He graduated from the Command and General Staff College in 1949. He served as Operations Officer, Pacific Sector, United States Army, Panama Area, during 1951-52. He is presently an instructor at the Command and General Staff College.

Logistical Aspects of Large-Scale Airborne Operations

Colonel Herbert A. Jordan, *Infantry*
Instructor, Command and General Staff College

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

IT IS the intent of this article to examine the feasibility of large-scale airborne operations, primarily from a logistical viewpoint and in the light of current developments.

New concepts of tactical operations and new developments of weapons and matériel, which differ materially from former concepts of military operations and current types of weapons and matériel, normally are accompanied by prophecies and conjectures from both professional military personnel and laymen alike, which are completely out of proportion to the actual capabilities of the new concept or development. This has been true down through the period of military history.

There have been a number of outstanding examples of these prophecies and conjectures during the past few decades. The use of poison gas by the Germans during World War I gave rise to the conjecture that entire armies and large segments of the civilian population would be destroyed by poison gas in any future war. The rapid development of the airplane subsequent to World War I as a vehicle for delivering destruction was hailed by many professional soldiers, pseudo-strategists, and average citizens as a substitute for armies and navies and a means of obtaining a quick victory with a minimum expenditure of life and matériel.

The development of the atom bomb, coupled with the development of the modern airplane, has caused considerable professional comment pointing to the elimination of large-scale amphibious operations and the substitution of large-scale airborne operations in lieu thereof.

The basic weakness of these prognostications is that the new weapon or concept is usually considered independent of other factors which influence its employment. For example, the prophets of mass destruction through the use of poison gas have failed to consider such factors as protective devices, methods of delivery, meteorological conditions favoring or disfavoring the use of the weapon, possible reaction on the part of the nation subjected to mass chemical attack, and countless other considerations.

The field of logistics, probably more than any other factor or combination of

Considerable development will be necessary before large-scale, long-range, independent airborne operations, which require air-transported logistical support over an extended period, can be considered feasible

factors, influences the extent to which a new concept or weapon may be employed. Such logistical factors as availability of critical materials, cost in personnel and materials with the resultant effect upon the national economy and upon the procurement and distribution of other war matériel, and methods of delivery or employment have a decisive effect on the extent to which a new concept or weapon may be employed.

Basic Assumptions

For the purpose of this discussion, it is assumed that large-scale airborne operations will embrace a force of at least three corps of three divisions each, with the necessary supporting troops. Let us further assume that these operations will be of two basic types:

1. An early ground or sea link-up type of operation.

2. A long-range independent operation with necessary support being furnished through the use of air transportation over an extended period of time.

Logistical Characteristics

The logistical characteristics peculiar to airborne operations are:

1. Very limited supporting services can be provided during the initial phases of an airborne operation. This increases the difficulties of control, supply, evacuation and hospitalization, transportation within the airhead, and development of facilities within the airhead, as well as communications maintenance, and other services. Because of the cargo limitations of even the largest aircraft currently being produced or scheduled for production, this limitation cannot be completely overcome until overwater and overland contact with the supporting bases are established or until the required matériel and facilities can be obtained from indigenous sources within the airhead.

2. Inclement weather has a much more restrictive effect upon the logistical support of airborne operations than it does upon other types of operations.

3. Initially, all supplies and equipment must be landed in the airhead by parachute or powered aircraft. This requires special packaging and distribution procedures.

4. More flexibility is obtained in the location of supporting depots in airborne operations since ground lines of communication and terrain features between the airhead and the depot do not have the same influence as they would in normal ground operations.

5. The cargo load of an aircraft varies with the range or radius of its operations, the anticipated condition of the landing air strips it will utilize, the meteorological conditions, and the altitude at which the aircraft must fly. Supporting distance (between the airhead and the supporting base) is limited to the range or radius of each type aircraft unless large-scale in-flight refueling operations are conducted. (These conditions are not applicable to normal ground transportation.)

6. Logistical operations within the airhead are limited in flexibility because of the limited amount and types of transportation and equipment which can be airlifted into the objective area.

Historical Examples

World War II history provides a number of examples of airborne operations—the largest ones were on a corps scale in Normandy, Holland, and in crossing the Rhine. These, however, were not corps operations in the same sense in which we consider normal ground operations, for although they embraced the basic airborne divisions, they did not include the normal corps supporting elements usually associated with ground operations. In addition, they were planned for short-term, independent operations predicated upon a quick link-up with other ground elements.

Plans were developed for the employment of an airborne army; however, these plans never were implemented because of Germany's capitulation in May 1945. Therefore, we have no historical precedent on which to base a discussion of truly large-scale airborne operations deep within enemy territory, which required air support over an extended period of time.

There is no doubt that the limited objective type of airborne operation of World War II contributed greatly to the ultimate defeat of the Axis powers. It should be recognized that these operations were subsidiary to, and were in support of, the larger forces engaged in amphibious or large-scale ground operations. However, it does not necessarily follow that airborne operations of the future will be of a subsidiary or secondary nature.

Future Airborne Operations

Assuming that trained tactical units are available in the required numbers, the scale on which an operation of any type can be conducted is limited by the logistical support which can be provided to mount and support the operation. This limitation is even more pronounced in the case of airborne operations because of the restrictions placed upon air transport by bad weather conditions and the cargo capacity of individual aircraft.

As the scale of ground operations increases, the logistical problem is basically one of increasing the flow of logistical support to the forces concerned. This is also true of airborne operations.

In large-scale airborne operations where the force must operate independent of land or sea lines of communication, materiel and services essential for sustained combat against a well-trained and well equipped enemy must be provided. Therefore, the logistical problem is to devise means to approximate as closely as possible the support in matériel and services furnished *large-scale* land operations.

It is generally agreed that small-scale airborne operations and large-scale airborne operations involving a quick link-up with other ground elements or the early establishment of ground or sea contact with the supporting base normally pose no insurmountable logistical problems. However, a comparison of these types of operations with the large-scale, long-range type, which requires air logistical support over an extended period of time, produces many logistical considerations which require solving before they can be considered feasible from a logistical viewpoint.

Two Hypothetical Examples

The assumption is made, for the purpose of this discussion, that the invasion of a large land mass is contemplated and that two principal courses of action are being considered. Course 1 concerns a large-scale airborne operation involving a shallow penetration of enemy territory, with an early capture of ports and sufficient area to permit the rapid development of a base for further offensive operations and an early link-up with land or amphibious elements.

Course 2 involves a large-scale airborne operation deep within enemy territory, independent of other friendly ground, naval, or amphibious elements, and requires sustained air logistical support. It is also assumed that present concepts pertaining to the scale and the scope of logistical support normally furnished forces will apply to both courses of action.

Equipment requirements for either of the two courses of action may be essentially the same; however, the types and quantity of equipment that can be delivered to the using units under the two courses varies considerably. Under the first course of action, dependence is

placed upon early land or sea contact with the supporting base for heavy items of equipment which are not air-transportable. In the second course of action, all equipment required for the successful conduct of the operation must be air-transported or obtained from indigenous sources within the airhead.

Some of the major items of equipment normally found in a field army and which cannot be air-transported are listed below, with the possible effect that their absence may have upon the operation.

Heavy Engineer Equipment

Heavy engineer equipment such as cranes, loader buckets, semi-trailers, and similar items is essential for heavy road construction and maintenance. Under course 1, roads in the airhead may be maintained with the lighter air-transportable equipment until contact is gained with the ground or sea follow-up echelon containing heavy equipment. In course 2, all road construction and maintenance must be accomplished with the lighter air-transportable equipment throughout the operation since there is no ground or sea follow-up echelon.

Medium and Heavy Tanks

The lack of tanks deprives the airborne force of one of its major means of shock action and antitank protection. The airborne drop is a major shock action, and in course 1, the land or sea follow-up echelon will provide the airborne elements with armored units and equipment to assist in maintaining shock actions. Under course 2, after the shock action of the initial airborne drop has been dissipated, the airborne and air-transported troops must depend upon what shock action the infantry and artillery can provide, supported by only light tanks. Thus, in course 2, each airborne and air-transported division must operate without its normal complement of medium and heavy tanks and their 90-mm guns. If the enemy has an armored capability, the airborne force will be faced with a serious deficiency in antitank protection and will be deprived of one of its most potent means of exploitation. In course 1, there is a capability of reinforcing the airborne elements with heavy armored units, while in course 2 this capability does not exist.

Artillery

Some of the heavier calibers of both towed and self-propelled artillery are not air-transportable. In course 1, this deficiency may be overcome partially by the use of naval gunfire if the airhead is located so as to permit its use. This possibility does not exist in course 2. However, in either course of action, the lack of heavy artillery can be compensated for partially by the use of additional combat aviation. This, in turn, will increase the over-all requirement for aircraft with an accompanying increase in such logistical considerations as fuel, maintenance, transportation, and airfield construction.

Other Considerations

In course 1, numerous services can be sacrificed until link-up with the land or sea follow-up echelon is accomplished. Maintenance can be limited initially to the lower echelons of maintenance. Facilities such as bath and laundry, refrigeration, bakery, and sales stores can be excluded from the airhead until link-up is accomplished with the land or sea follow-up echelon. Construction can be limited initially to that which can be accomplished with materials available within the airhead.

In course 2, these services must be provided either through the use of air transportation or through the exploitation of local resources. The requirements for engineer construction materials alone will create a marked logistical problem since these materials constitute approxi-

mately 11 percent of the normal maintenance tonnage. The requirement for large numbers of landing strips and airfields in the airhead undoubtedly will increase this percentage.

Hospitalization and Evacuation

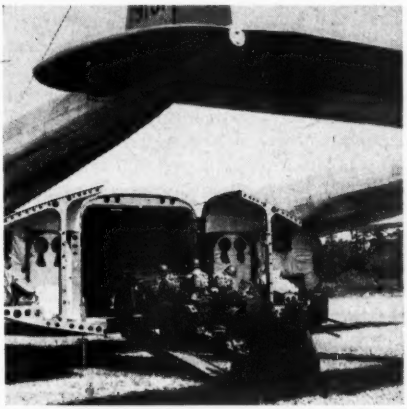
The problem of evacuation and hospitalization is essentially the same for both courses of action. For course 1, medical units can be limited to those capable of providing emergency treatment and holding facilities for a short period of time. All casualties requiring hospitalization would be evacuated by air as rapidly as possible.

The same general procedure applies to the second course of action, except that additional facilities in the form of evacuation hospitals will be required within the airhead. Patients requiring fixed bed hospitalization would be evacuated from the airhead except in those rare cases where adequate fixed bed hospital facilities are locally available in the airhead. Since the standards of medical treatment in most probable areas of future operations are far inferior to those found in the United States, it is extremely unlikely that fixed bed hospital facilities in any appreciable quantity even would be available for United States military use.

The provision of air transportation for the evacuation of casualties after the initial assault and after fields are available for powered aircraft will pose no particular problem under either course of action, since aircraft transporting personnel and matériel into the airhead can be utilized for the evacuation of casualties on their return trips.

Replacement Personnel

The evacuation of casualties produces a related logistical problem which assumes significant proportions under the second course of action. Personnel replacement requirements bear a direct relationship to the evacuation policy. For every casualty evacuated under the second course of action, a replacement eventually must be flown into the airhead, thereby increasing the airlift requirements into the airhead. This condition does not apply necessarily to the first course of action since an initial overstrength can be provided to compensate partially for personnel losses until ground or sea link-up is accomplished. At this time, personnel replacements can be transported by ground or sea transportation.



Airborne troops loading a quad-mount and jeep into the cargo hold of a *C-119 Packet*.

Air Distance

During the assault phase, the airlift requirements may be essentially the same for both courses of action; that is, if the distance from departure airfields to the airhead is approximately the same. However, additional fuel requirements at longer ranges cause a resultant reduction in allowable cargo loads. The total number of aircraft required to transport a given number of units under the second course of action will be greater in all probability than the number required under the first course of action. This is based upon the premise that an area deep

in enemy territory will be at a greater distance from departure airfields than a shallow penetration of the hostile area.

Economy or Long-Range Planning

The principle of economy of force can be applied readily to the utilization of aircraft under course 1, since aircraft can be diverted from other areas or theaters for a limited period of time. They can support the operation until the ground or sea link-up is accomplished; at this time the aircraft can revert to their former missions or they can be used to meet new commitments. Under the second course of action, the application of this principle is more difficult because extremely large numbers of aircraft will be required for the entire operation. The detachment of large numbers of aircraft from other areas or theaters for an extended period of time will require careful consideration at the highest level to determine its strategic significance in the light of theater and world-wide strategy.

As an alternative, additional aircraft can be procured from production sources to meet the requirements of the second course of action. This, in turn, will necessitate planning for this type of operation far in advance of the contemplated target date, in order to provide sufficient procurement lead-time to ensure availability of required aircraft at the proper time. The decision to manufacture aircraft in sufficient numbers to support an operation of this type, with a minimum diversion from other commitments, must be evaluated in terms of the results expected or advantages to be gained versus the impact of such procurement on the national economy and upon the procurement of other war matériel.

Future Developments

Airborne operations have many inherent tactical advantages over other types of operations. Therefore, the logistical limitations of large-scale airborne operations should be examined in the light of possible future developments to reduce these logistical limitations, thereby permitting a more complete utilization of these tactical advantages.

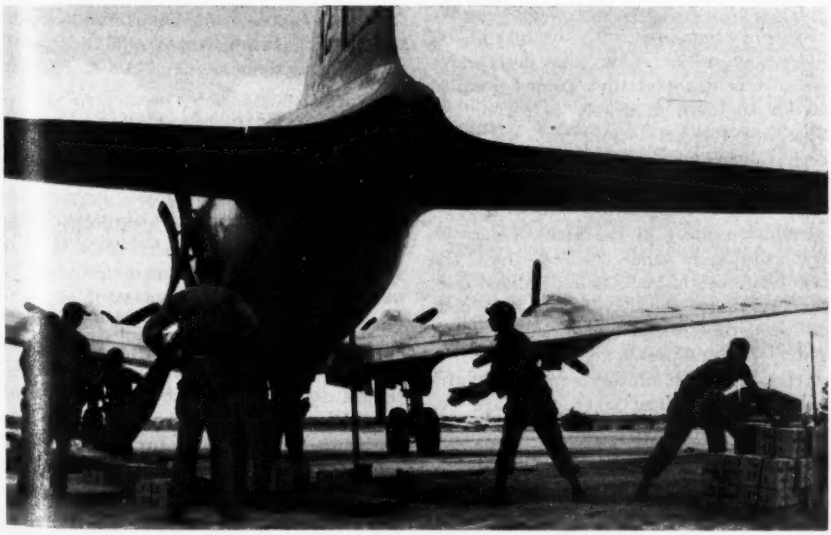
Current trends are toward lighter equipment for the infantry soldier and reduced weight for some types of heavy equipment in order to increase their air-transportability. Current programs will reduce further the logistical problems associated with the quick link-up type of airborne operation. However, before the large-scale, deep penetration type of airborne operation can be considered feasible, a comprehensive and cohesive program of equipment development is required. This program must be correlated with the tactical and strategic concepts of large-scale, deep penetration type of airborne operation to ensure that a force equipped with the proper offensive and defensive weapons can be landed and supported over an extended period of time. The first consideration in this program should be the elimination of all personnel, equipment, and supplies from the airborne or air-transported organization which may be classified as comfort or convenience items and which do not make a direct contribution to the successful accomplishment of the tactical mission.

Equipment

Heavy engineer equipment may be replaced by lighter types or may be so designed as to permit partial dismantling for air transportation. The use of indigenous labor can supplement or replace, to a large degree, the requirement for some types of engineer equipment in the airhead.

Medium and heavy tanks and the heavier calibers of antitank guns become critical items when the enemy has a major armored capability. Current inability to transport tanks heavier than the light

Initially, all supplies and equipment must be landed in the airhead by parachute or powered aircraft. This requires special packaging and distribution procedures. Above, supplies and equipment being dropped by parachute to troops in Korea. Below, American troops unloading rations from a *C-54 Skymaster*.—Department of Defense photos.



tank makes the airborne force extremely vulnerable to armored attack. This weakness in airborne operations can be overcome by the development of effective antitank guided missiles, the possible modification of the light tank to accommodate heavier caliber guns, the possible development of a split hull type of tank which can be broken down into a limited number of components which are air-transportable, and the continued development of recoilless weapons.

Guided Missiles versus Artillery

Rockets and guided missiles can substitute for the heavier calibers of artillery. Because of the inaccuracy of current types of rockets and the huge volume of fire which can be delivered from this weapon, the problem of ammunition supply in airborne operations will be of considerable magnitude. The use of large numbers of guided missiles in lieu of the heavier calibers of artillery must be analyzed carefully in terms of economical impact versus results expected. Because of the high cost of guided missiles as compared with the cost of artillery ammunition of the same destructive effect, it is doubtful that guided missiles can be employed profitably as a complete substitute for artillery within the foreseeable future. The development of the heavier calibers of artillery into air-transportable components which can be assembled readily in the airhead may be more profitable and efficient than the large-scale use of rockets and guided missiles. However, there will still be a definite need for rockets and guided missiles in airborne operations to supplement the heavier calibers of airborne and air-transported artillery when they are developed.

Aircraft Development

Present developments pertaining to the use of detachable pods on transport aircraft will assist materially in loading and unloading operations at departure airfields and within the airhead, and will increase the number of sorties obtainable with a given number of aircraft. Extensive use of long-range cargo and personnel carrying helicopters and assault cargo planes will reduce the requirement for prepared airfields, thereby reducing construction and airfield maintenance requirements. The development of tracked landing gear, ground arresting devices, and the use of jato (jet assisted take-off) will reduce further the requirement for airfield construction and maintenance. Parachute developments will increase the size and weight of loads which may be dropped in the airhead. However, these developments will be of primary benefit to the short-range, quick link-up type of airborne operation until such time as long-range, independent airborne operations become more feasible. Radical developments are needed to reduce fuel consumption and increase range and cargo capabilities of aircraft in order to conduct long-range, deep penetration airborne operations with a reasonable degree of efficacy and economy.

Reduction of Services

The field of services has many opportunities for reduction and elimination in order to increase the logistical feasibility of large-scale airborne operations. Past and current trends to approximate the comforts and conveniences of the Zone of Interior in the combat zone must be ruthlessly opposed. This is particularly true in airborne operations where transportation is a critical factor. This is not intended to mean that the combat soldier should be denied those comforts and conveniences which can be supplied at negligible expense to the tactical effort. However, the overriding consideration must be the contribution that such organized serv-

ice has to offer to the successful accomplishment of the tactical mission. The proper application of the principles of leadership, coupled with improvisation and substitution, can eliminate in many cases or drastically reduce the requirement for certain organized services which are provided pursuant to current doctrine.

This aerial view, taken during the invasion of Holland by airborne troops, shows part of the vast air fleet which participated in the operation.—Department of Defense photo.

Field Bakeries

Field bakeries, with their attendant heavy equipment and associated distribution systems, may be curtailed or eliminated if some provision can be made for unit mess personnel to bake bread in their field kitchens. Possibly this may be accomplished with the usual raw ingredients in the hands of trained mess personnel, or a prepared mix may be developed and packaged to simplify distribution and preparation in unit kitchens. The capacity of unit kitchens may be supplemented through the use of indigenous facilities when available.

Bath and Laundry Units

Quartermaster bath and laundry units are a welcome convenience, but the combat soldier seldom has an opportunity to take advantage of their services, and the rear area soldier is in a better position to improvise or locate bathing and laundry facilities. Improvisation, supervision, and discipline can reduce materially the requirement for this organized service.

Sales Stores

Sales stores can be eliminated in the combat zone by the issuance of clothing and equipment to officers through normal supply channels under a pay deduction system or gratuitous issue, thereby eliminating the handling of cash.

Special Services

Special Services personnel and units can be reduced drastically or eliminated, and recreational equipment can be issued through other supply channels. The mo-

rale and welfare of subordinate personnel is a command responsibility and any competent commander is capable of conducting and supervising his athletic and recreational program without the assistance of special personnel whose services make no direct contribution to tactical operations. The unit or organizational chaplain can assist the commander in this function in addition to his normal religious and moral activities.

Post Exchange Facilities

Post exchange personnel in the airhead can be reduced by issuing post exchange supplies through quartermaster supply channels and by using local facilities, supplies, and personnel to the maximum extent practicable.

Utilization of Local Resources

Local resources, both matériel and personnel, can reduce appreciably the logistical requirements on the military force for labor, transportation, supply, and maintenance. Our military organization has been based in the past on a policy of self-sufficiency. Little or no dependence has been placed on the utilization of local resources in our operational planning. These resources have been exploited only partially on a day-by-day basis in actual operations. Indigenous personnel can be employed profitably in labor units to supplement or replace military labor units such as quartermaster service companies. Local labor can be organized into Transportation Corps truck companies, and in many cases they can be trained to supplement or replace maintenance, depot, and construction personnel. Maximum use of local materials, consistent with the maintenance of the local economy, can reduce materially the shipping requirements into the airhead. The acquisition of Engineer Class IV supplies from local sources in the airhead is particularly important, in view of the tremendous tonnages required for airfield construction and maintenance.

Dual Missions for Service Units

The training of service units to perform dual missions can reduce the over-all total of service troops required to support an operation. There is considerable room for unification within the Army, as well as within the National Defense Establishment. Compartmentalized service is conducive to duplication of effort, with a resultant waste in manpower and matériel. Any action in this respect must overcome inter-branch and technical service jealousies and may require uncompromising decisions at the highest level. Ordnance maintenance units can perform, with little additional training, chemical and a considerable portion of engineer maintenance. The Quartermaster Corps can assume, with a minimum effort, the functions of chemical processing companies.

Co-ordinated Logistical Support

The establishment of a logistical command in the airhead may contribute to the production of an efficient and well-co-ordinated logistical support team, with a minimum duplication of effort and a maximum economy in personnel. Our present organizational structure in the combat zone provides for an army service area with each technical service responsible for its unilateral functions therein. The army commander alone has over-all command responsibility for logistical functions of the several technical services within his area. He can look to his subordinate corps commanders for tactical operations. The ever increasing scope of logistical operations indicates the desirability of delegating the operational responsibility for logistical operations to a centralized logistical operating agency, subordinate to the army commander. This command organization can direct as well

as co-ordinate all of the logistical functions in the area, thereby relieving the army commander of many time-consuming details and providing one focal point from which policies and procedures emanate.

Current capabilities of evacuation and hospitalization units, personnel, and equipment do not indicate any required developments of a radical nature, to support large-scale, deep penetration airborne operations. The evacuation policy in connection with this type of operation may indicate some revision in theater replacement command organization, policies, and procedures.

Summary

Airborne operations have proved in the past their value in influencing the course of tactical operations. Up to the close of World War II, airborne operations were limited to the short-range, early link-up type of operation. While these operations exercised a decisive influence on the course of specific operations, they did not constitute a decisive element of any major campaign.

Logistical considerations that influence the scale and scope of airborne operations include:

1. Limited number of aircraft normally available to mount and support airborne operations.
2. Restrictive effect of inclement weather on airborne operations.
3. Special packaging and distribution procedures required for air delivery of supplies and equipment to the airhead.
4. Location of departure airfields and supporting depots and distance to objective area.
5. Limited cargo capacity of individual aircraft which limits the size and weight of individual items of equipment which can be transported into the airhead.
6. Requirements for fuel to be transported into the airhead if aircraft are operating under range conditions.
7. Airfield and landing strip construction requirements in the airhead.

The logistical limitations of large-scale, deep penetration types of airborne operations are more pronounced than those of a large-scale, shallow penetration type of operation involving a quick link-up with ground or sea elements.

Large-scale airborne operations require vast numbers of transport type aircraft. These can be diverted usually from other areas or theaters to mount and support the operation for limited periods of time. In those cases where additional aircraft must be manufactured to support a large-scale, deep penetration type of airborne operation, the impact on the national economy and on the procurement of other war matériel will be, in all probability, a critical factor.

Conclusions

Future warfare certainly will include a marked increase in the use of aircraft to mount and support military operations. Large-scale airborne operations of the quick link-up type undoubtedly will play a major role in influencing the course of tactical operations. Considerable development will be required before large-scale, deep penetration types of airborne operations, requiring logistical support over an extended period of time through the use of air transport, can be considered feasible from a logistical viewpoint. These developments should be conducted with the maximum dispatch. The advantages to be gained from such development will not be limited to airborne operations but will have application to military operations as a whole.

THE ARMY MANAGEMENT IMPROVEMENT PROGRAM

Lieutenant Colonel Charles H. Waters, *General Staff*
Management Division, Office of the Comptroller of the Army

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

PRIOR to World War II, the Army was a small organization which could manage its affairs without complicated systems of control. The resources allotted to the Army were very limited, and, of necessity, the Army concentrated on stretching them as far as they would go. The efforts of the rank and file along certain lines made a byword of the term "scrounging." Today the Army must house, feed, equip, transport, and utilize more than 2 million personnel who are scattered all over the world. The impact of this task on the Nation's economy is such that the Army must perform in the most effective and efficient manner. As the Army has grown in size and in the complexity of its operations, many of its management practices of the past have proved inadequate and new controls and procedures have become necessary.

This experience has prevailed throughout the armed forces and, in some degree, in all Federal agencies. The President, in his 1951 budget message, called for a program of management improvement by all agencies of the Government. The Bureau of the Budget then defined this program and outlined some of the steps to be taken. On 20 April 1951, the Secretary of Defense requested the military services to initiate improvement programs in harmony with the Bureau of the Budget's instructions. The Army's formal program, aimed at improving management in its broad sense, may be said to date from June 1951, when regulations were published establishing an Army-wide management improvement program.

It should be noted, however, that for a number of years previously, various agencies of the Army, particularly the service forces during World War II, had management offices and applied certain management engineering techniques. The military and civilian members of the Army have always been expected, as a normal aspect of their individual jobs, to work efficiently and to raise standards of performance. Thus, the management improvement program is not revolutionary; rather it is a formal approach to the problems of awakening in the minds of personnel a consciousness of the need for making improvements, and of organizing and systematizing efforts to improve the way the Army conducts its activities.

The Comptroller

Management improvement is a function of command. It is not something that is *done to* a commander or supervisor; rather it is something that he must *do himself* as an inherent part of providing leadership to his organization. The commander, however, does need staff assistance in planning and administering his management improvement program, and in the various commands throughout the

Army the comptroller is considered the proper staff element to assume this responsibility. The Secretary of the Army looks to the Comptroller of the Army as the staff element responsible for developing plans and policies, guiding the execution, and determining reporting requirements of the over-all Army management program.

While the comptroller is considered the proper staff element to tie together the many components of the management improvement effort of an organization, commanders are expected to use other staff offices or special agencies to develop improvements in areas for which such offices have a primary interest. Thus, G1 is called on to initiate staff action to effect improvements in personnel management and in various administrative fields, G3 to take staff action to improve various aspects of training, G4 to handle the improvement of supply and procurement, and the information officer to publicize the management improvement effort and to provide a major portion of the mediums for indoctrinating personnel in cost consciousness.

The Proper Perspective

Since management improvement has always been an important objective of many long standing activities of the Army, it is important to view the management improvement program in proper perspective. This program is not a substitute for, or consolidation of, programming, budgeting, accounting, reporting, activities of the Inspector General, command inspections, or any other activities customarily associated with command and administration. The management improvement program embraces all existing programs of the Army and was designed to cause them to be conducted with greater efficiency and effectiveness.

Management improvement programs, at whatever command level they may be found, generally will include certain subprograms or supporting actions of a continuing nature. Among the more important of these components are those dealing with:

1. Work simplification training.
2. Manpower utilization studies.
3. Management surveys.
4. Performance analysis.
5. Incentive awards.
6. Economy indoctrination.

The Army has sought to avoid the impression that management improvement is something which is handed down from above. This is based on the premise that each command and installation is potentially the best judge of its most fertile fields for improvement. Accordingly, the Department of the Army's basic directive for implementing an Army-wide management improvement program requires the major commands, in the United States and abroad, and the technical and administrative services to formulate and carry out formal management improvement programs applicable to their fields of activity.

Perhaps the one single action by the Department of the Army which has given greatest impetus to generating active management improvement programs at its field installations was the directive issued early in 1952 which required the appointment of comptrollers throughout the Army down to the post level. Heretofore, some major commands had shown

Management improvement is a function of command; not something that is done to a commander. It is something which the commander must do as an inherent part of providing leadership for his organization

little initiative in providing management engineering and review and analysis services at the post level. In such commands, management improvement and associated programs were usually least effective.

Special Projects

From time to time, it becomes evident that certain lines of action or areas of activity should be given general attention throughout the Army establishment with the result that special projects have been assigned to certain Department of the Army staff agencies. Currently, G1 and G4 are directing special emphasis to six special areas identified as:

1. Administrative vehicles.
2. Construction.
3. Printing and publication.
4. Communications.
5. Small unit administration.
6. Office supplies and equipment.

In addition to the formal management improvement programs of subordinate echelons and the special areas for emphasis Army-wide, there is a third feature of the Army management improvement program. This third feature is composed of those management improvement projects which have been undertaken by the Department of the Army staff, particularly the Comptroller of the Army. The remainder of this article will discuss some of these projects.

The Primary Programs

The Department of the Army is working to improve and extend the Army's program management system. The missions of the Army have been classified into 15 broad categories known as the primary programs of the Army, and are identified by function, such as training, supply, and construction. For each program, a Department of the Army staff agency known as the program director has been given over-all responsibility. During the past 2 years a series of special regulations has been published, one for each of the primary programs, which established procedures and responsibilities for the execution and review and analysis of these programs. This year it is planned to complete the extension of the system to major continental commands and the incorporation of program management training in Army schools. The program management system should facilitate an appraisal of the Army's responsibilities and better coordinated direction from the Department of the Army to the major commands.

The primary program structure and the performance budget structure of the Army were developed somewhat independently and it has become evident that a maximum degree of coincidence between these two systems is essential for adequate budget defense and efficient control over Army operations. A practical plan for harmonizing the performance budget and primary program structures is now before the Secretary of Defense for approval and submission to the Bureau of the Budget.

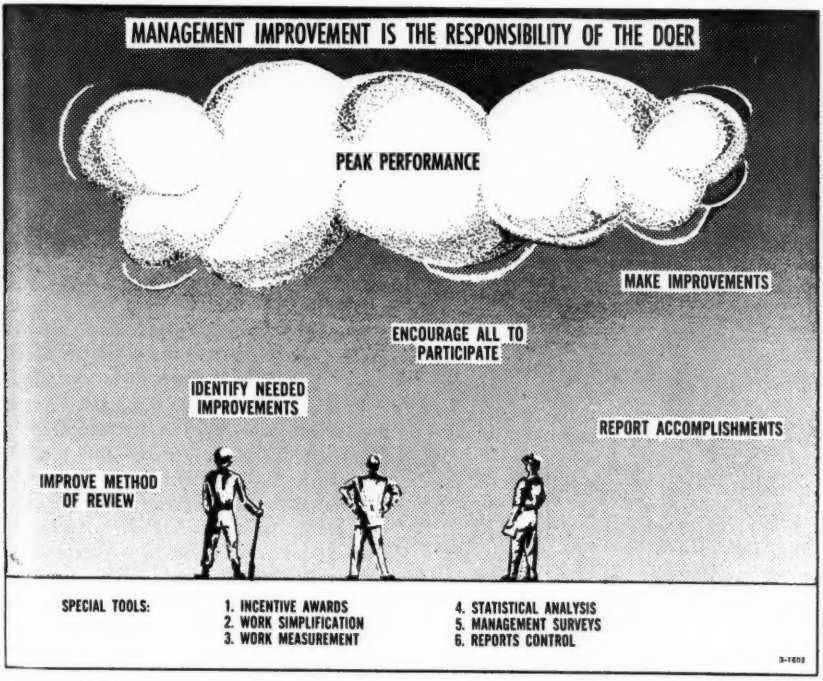
Management Training

During the past 2 years, measures have been taken to improve and extend management training. A graduate-level course in the principles of comptrollership, especially designed to meet Army needs, was established at Syracuse University and the first class of 25 officers enrolled in June 1952. A course in the techniques of review and analysis has been instituted at the Army Finance School to train military and civilian personnel who are engaged in such activities within Army field agencies.

Plans are underway to provide for an increased indoctrination of *all* officers in the principles of general management and the functions of comptrollership by incorporating periods of instruction in such subjects into the curriculum of all service schools from basic branch schools to the Army War College. This comprehensive comptroller education and training pro-

gram should result in an improved technical performance by comptrollers and their staffs and an improved understanding and acceptance of comptroller services by all commanders and staffs.

For the general training of all types of supervisory personnel, it is anticipated that during this fiscal year more than 400 installations will conduct work simplification training. The Comptroller of the Army is promoting this training through the preparation of graphic charts, pamphlets, and films, and by work simplification clinics and conferences which comptroller personnel are conducting.



Performance Analysis

Considerable study has already gone into the Army's project to establish a system of performance analysis. The objective of this device is to provide data which permit a systematic analysis of performance effectiveness and which assist management in such fields as budgeting, staffing, programming, and personnel administration. The services of a professional management consultant firm have been employed to provide the necessary technical assistance on this project.

At the present time subordinate elements of the Army have developed and applied, in varying degrees, their own concepts of performance analysis. The Department of the Army program contemplates that initial concentration will be directed toward setting up performance analysis systems within those major commands where there is now only a partial system. Uniformity of the system is, of course, the eventual goal; however, this must be reached in stages.

Army Regulation 11-20, *Army Performance Analysis System*, which announced over-all Army policy with respect to the utilization of performance analysis, was published on 7 January 1953. Pilot tests were initiated at several installations on 1 February 1953, to determine the feasibility of detailed procedures contained in proposed special regulations for implementing the Army performance analysis system.

Management Survey Program

Since 1949, the Department of the Army has conducted a program of large-scale management surveys. These appraisals deal with administrative organization, operations, and methods of major Army elements such as a technical service or continental army. While the search for ways to achieve economy is given particular emphasis, the all-important objective of these surveys is to arrive at the most effective operating relationships and management methods to enable the Army to perform its missions in the defense of our country.

A basic tenet of the Army's management survey program is that the co-operative support and participation of the unit being surveyed is essential. Another basic concept is that, to the fullest extent possible, the benefits of a survey should be made effective while it is underway. It is, of course, essential that careful follow-up be given to the implementation of accepted survey recommendations.

Survey Program Progress

In the past 3 years, large-scale surveys have been completed on the Corps of Engineers, the Chemical Corps, Finance Corps, and the Quartermaster Corps, and surveys of the Ordnance Corps and the Transportation Corps have reached the stage of final analysis. Even before the outbreak of hostilities in Korea, the Office of the Chief of Engineers reported an estimated dollar valuation of economies resulting from action on survey recommendations which amounted to between 2 and 3 million dollars annually. The recent decentralization of operating responsibilities from the Office of the Chief Chemical Officer to three field commands—training, procurement and supply, and research and engineering—stemmed from recommendations brought out in the Chemical Corps survey.

During this fiscal year, the emphasis of general management surveys by the Department of the Army will shift from the technical services to the major commands. A comprehensive management survey is being made of the First Army headquarters and area activities. One of the problem areas presently being investigated in this survey is the proper organization and functions of the First Army with respect to handling the Reserve Corps program within the army area.

Industrial Fund Program

Public Law 216 of the 81st Congress authorized the Department of Defense to establish industrial funds for financing inventories and providing working capital for industrial or commercial type activities of the services. The Army has made a start on this program by establishing, on an industrial fund basis, the Rocky Mountain, Pine Bluff, and Picatinny Arsenals; printing plants at Ogden and St. Louis; and the manufacturing divisions of the quartermaster depots at Jeffersonville and Philadelphia.

The establishment of working capital funds provides management, for the first time, with financial and other data to check costs and upon which to base decisions controlling the operation of industrial type activities of the Army which run into millions of dollars each year. The industrial fund concept substitutes commercial methods of financing, budgeting, and accounting for the more cumbersome methods of multiple fund appropria-

tions. It provides the industrial activity commander with one fund to finance his operations by which he produces a product which he costs, and sells at cost. Consumer installations are funded so that they purchase products from industrial fund agencies rather than requisition free issues, and thereby a buyer-seller relationship is obtained which should cause the ordering agency to be critical of costs.

The Department of the Army contemplates the eventual establishment of an industrial fund system at each installation where the activities lend themselves to this application. During the next 2½ years, 54 industrial or commercial type installations will be examined, and single funding will be introduced into those for which it is determined feasible. In connection with this program, contractual services will be used almost entirely in setting up accounting systems and related procedures.

Operation 'Red Tape'

Early in fiscal year 1952 a project known as Operation *Red Tape* was instituted which requires investigation of the necessity for every report, every record, and every administrative procedure used in the Army. Each major element of the Army staff is making a continuing, critical examination of administrative requirements within its field of interest. Examples of improvements already attained are:

1. New procedures have been worked out which reduce the routine re-enlistment processing time from several days previously required to approximately 15 minutes and require the re-enlistee to sign only two forms.

2. In order to facilitate the efficient use of manpower by broadening the fields in which individuals may be employed, the list of military occupational specialties (MOS) has been reduced from 518 to 300 for enlisted personnel and from 800 to 635 for officers.

3. More than 1,500 local records and forms have been reported eliminated by field installations as a result of screenings under the Department of the Army records project.

At the present time, action to streamline administration continues with objectives such as: the elimination of the Daily Sick Report and the elimination or consolidation of individual personnel forms and procedures.

Cost Consciousness Campaign

A program which has been receiving concentrated attention over the past year by way of making the Army more management and economy minded has been the "cost consciousness campaign." Instruction on "cost consciousness" is conducted in all service schools, and in all Army training programs. The "cost" theme is continuously plugged through various mediums of troop information, which include 450 Army newspapers, 73 Army-controlled radio broadcasting outlets overseas, and numerous posters and exhibits at Army installations. Commanders at all levels have had to effect close coordination between their public information officers, troop information and education officers, unit comptrollers, and other staff members in order to associate the several economy programs of the Army with each other and to create the necessary "awareness of costs" among Army personnel.

During the current fiscal year, cost consciousness indoctrination is being focused on three principal objectives:

1. To provide a stronger motivation for the practice of economy by emphasizing the economic nature of the cold war now being waged by the Communists.

2. To bring contracting officers and procurement personnel more closely into the program.

3. To provide indoctrination on the subject to more than 300,000 new personnel who will be entering Army service for the first time. In general, "cost consciousness" as a separate program is being subordinated to the integration of the "cost aspects" of Army operations into all Army programs.

Conclusions

The various projects which have been described are indicative of the importance and effort which the Department of the Army attaches to the promotion and development of improved procedures and management systems. The most important feature, however, of the Army-wide management improvement program will always be the organized, specific improvement efforts of the operating echelons. Significant progress is now being made in the development of management improvement programs at all levels down to installations. Never before has the Army been so management-conscious. However, the Army can never be made into a machine. It will remain a complex organization of constantly changing personnel who are involved in almost every type of activity. As one improvement is installed, another problem arises, and for this reason a vigorous, imaginative, and effective Army-wide management improvement program is ever present.

NEXT MONTH

The next issue of the MILITARY REVIEW will feature the article "The Lost Corps," by Lieutenant Colonel Robert C. Cameron, an instructor at the Command and General Staff College. The author describes the elimination of the ROK II Corps by the Chinese Communist forces in November 1950.

Colonel Cameron, who served with the II Corps during the period discussed, points out that the elimination of the corps was not the result of the employment of new tactics but rather the expert application of proved tactics on the part of the Chinese.

"The Battle Winner," from *The Journal of the Royal United Service Institution* (Great Britain), will be included in the "Foreign Military Digests" section of the magazine. This article points out that mobility—mobility of the individual soldier as well as an army—is the mainspring of success in war, since without it it is almost impossible to employ the element of surprise. The article discusses, through examples from the time of the Roman Legion to the battle of El Alamein, how mobility in the individual fighting man and the over-all forces was either improved or reduced during the evolution of warfare.

Supplying United Nations Troops in Korea

Major Pierre P. Kirby, *Transportation Corps*
Student, The Transportation School, Fort Eustis, Virginia

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

ALTHOUGH warfare in itself is strictly an unbusinesslike venture, getting supplies to the front can be put on a business basis. When fighting erupted overnight in Korea, the movement of all the accoutrements of war to that unhappy peninsula was a hurried and unscheduled operation. Men went into battle in an ever increasing crescendo as nation after nation committed forces on the side of freedom. Getting vitally needed supplies to these fighters was an important and urgent task.

Emergency Methods

Cargo planes racked up thousands of hours of flying time and all available rail, truck, and shipping transportation were hastily thrown into action. The job was being done, but not efficiently. Overtime for labor, special ship chartering, round-the-clock schedules, hasty unplanned loading of cargo, and other emergency factors added up to high operating costs.

Efforts to rectify this were thwarted by a rapidly changing tactical situation. Heavy fighting imposed enormous demands for emergency equipment which was thrown into combat immediately upon arrival. The tactical situation, changing almost daily, discouraged the setting up of large, permanent storage and supply depots on the peninsula. Land held today by United Nations troops might be either bypassed or far from the front tomorrow.

Inadequate Korean Ports

Ports from which United Nations forces could operate in Korea were few. Their restricted capacity to unload and process cargo caused entanglements and bottlenecks in the existing supply system. Stock-piling goods to ensure immediate combat availability was precluded because of the limited capabilities of the depots. Supply men of the Japan Logistical Command (re-designated United States Army Forces, Far East) were thus forced to ship limited amounts with greater frequency to lessen the danger of overcrowded ports and depots.

Advance Information Lacking

These factors, coupled with uncertain delivery dates and the lack of advance information on ship departures from the United States, resulted in the shipment of most of the vital goods directly to

Supplying the men at the fighting front can be put on a firm business basis. The Japan Logistical Command has saved about ¾ million dollars a month through its programmed movement of supplies to Korea

depots and warehouses in Japan, for transshipment to Korea at a later date. Meanwhile, such staple items as food and ammunition frequently had to be airlifted on a call-as-needed basis from the Japan Logistical Command's (JLC) storage depots in Japan. The tremendous supply

Supplies, stock-piled in Japan, waiting for scheduled shipment to troops in Korea.

system that clothed, fed, and equipped the fighting United Nations armies needed rejuvenation, and quickly.

Programmed Movement

The Commander in Chief, Far East, in response to the increasing needs of field commanders and mounting logistical problems, ordered that a joint study be undertaken to devise a system of programmed movement of supplies to Korea. The commander specified that the program must:

1. Adequately supply front-line troops at all times.
2. Cut down the tremendous expense involved in emergency operations and cargo shipment of war supplies.
3. Substantially decrease the emergency nature of supply support.
4. Provide reasonable stocks of supplies in Korea for future needs.
5. Effect maximum shipments direct from the United States to Korea.

By the spring of 1951 sufficient equipment had been stock-piled throughout the theater and the tactical situation had stabilized enough to provide the basis for a system of "programmed movement of supplies." Programmed movement can best be defined as the movement of specific quantities by specific facilities during stated periods of time.

Programmed movement of cargo and personnel is not a new idea, but JLC's specific technique for movement of supplies from Japan to Korea is new. Whereas the order and shipping cycle for supplies from the United States to the Far East Command is 120 days, the cycle from Japan to Korea is only 60 days. The Department of the Army's program of cargo and personnel movements is published using bulk projections of cargo to move within specific periods. JLC's program lists in detail individual totals of supplies to be moved by service, class, commodity, point of origin, outloading port in Japan, and receiving port in Korea.

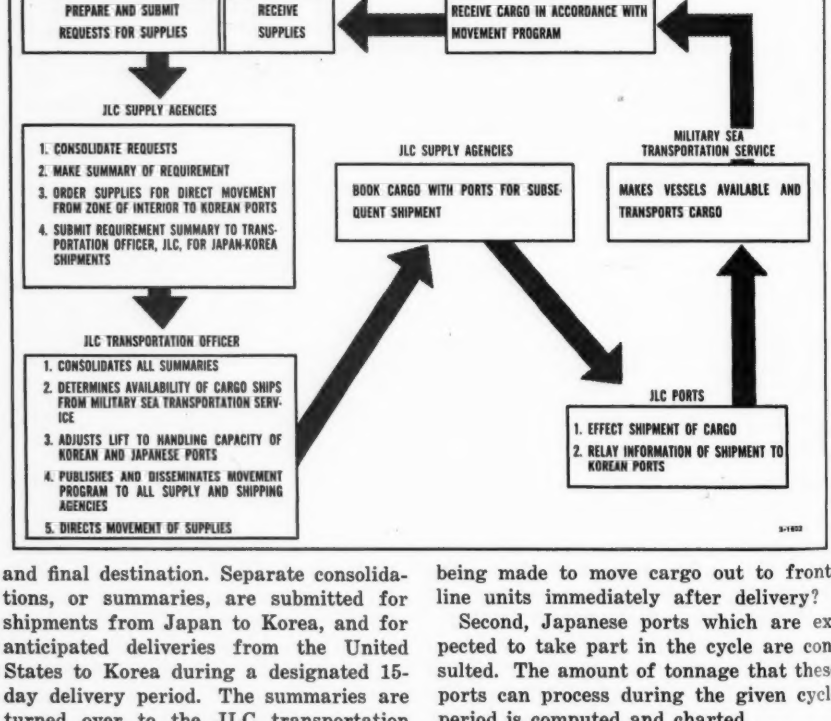
Calendar of Actions

Briefly, in JLC's support of the Korean effort, programmed movement meant the steady movement of supplies to Korea in accordance with a preconceived plan. This preconceived plan, wrought from timetables, charts, and professional know-how, is called a *calendar of actions*. The calendar is the nucleus of the programmed movement, listing in detail precise steps to be taken by the many agencies concerned in the major supply movement. It

The best equipment the world has to offer now flows smoothly through supply channels to ships, to ports, to depots, and to the United Nations fighting man. Above, LSTs unloading equipment and men on the beach during the invasion of Inchon, Korea. Below, supplies and equipment being stock-piled at a Korean port.—Department of Defense photos.

details, within a given shipping cycle, the deadlines for submission of requisitions, publication date for movement programs, booking of cargo, shipping of goods, and dates for departures and arrivals.

The using organizations order equipment from supply agencies in Korea who in turn notify JLC's supply agencies of their needs. The orders are consolidated and catalogued by service, class of supply, quantity, present location of stocks, and final destination. Separate consolidations, or summaries, are submitted for shipments from Japan to Korea, and for anticipated deliveries from the United States to Korea during a designated 15-day delivery period. The summaries are turned over to the JLC transportation officer for action.



The transportation officer plans shipping movements, tonnages, and port calls for cargo and shipping. By the use of JLC's calendar he can plot the answers to the maze of facts, figures, and shipping requirements before him, preparing a sound, all-inclusive movement program that will start gears turning, and equipment rolling.

First, contacts with Korean ports are made. What are the present, and the future, port capabilities? What are the physical facilities of the receiving agencies to unload ships, and the capacity of depots to store cargo? What plans are being made to move cargo out to front-line units immediately after delivery?

Second, Japanese ports which are expected to take part in the cycle are consulted. The amount of tonnage that these ports can process during the given cycle period is computed and charted.

With the full capacities of the Korean and Japanese ports before him, the transportation officer refers to his shipping charts. Tonnage, requested by technical services on a bulk basis, is transformed

to tonnage-per-type cargo, in view of the limited processing abilities of Korean ports.

Finally, liaison with the Military Sea Transportation Service establishes the number of ships that will be placed at his disposal for the operation.

Movement Program

On the basis of the assembled information the "movement program" is published. The program contains all the essential elements necessary to start cargo rolling from supply depots to cargo ships, and from cargo ships to Korean ports. Schedules, shipping requirements, types and quantity of cargo, point of origin, and destination are then established.

After publication, a conference with Army, Navy, Air Force, and Military Sea Transportation Service representatives is called. Difficulties are ironed out, last-minute changes are made, and a supplement to the movement program, reflecting the changes, is published.

After the conference, the "movement" goes into high gear. Copies of the program supplement are rushed to all concerned. The program is the go-ahead signal for many impatient men with a job to do. The program is the *work order* and JLC's machinery begins to hum. The printed program:

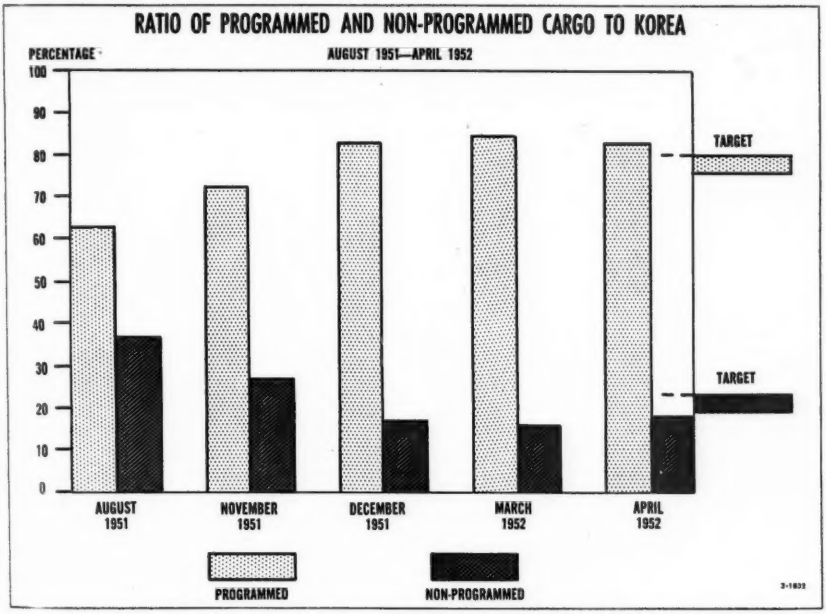
1. Serves as a request to the Military Sea Transportation Service so that shipping space may be provided for the movement of cargo.

2. Authorizes supply agencies in Japan to book cargo at appropriate ports for shipment to Korea.

3. Directs ports to accept bookings from supply agencies in Japan.

4. Directs ports to effect the timely shipping of equipment.

5. Informs ports in Korea and receiving depots of their forthcoming workload.



As soon as the loading of cargo is completed at ports in Japan, information governing the movement is relayed to Korea, to permit planning for its reception.

Co-ordination is the byword of the entire program. The ground work is finished. With co-ordination, the job of transporting, processing, and loading for shipment will carry the supplies through to the men at the fighting front. Troops now receive their supplies at the specified time. The best equipment the world has to offer now flows smoothly through supply channels to ships, to ports, to depots, and to the United Nations fighting man; and JLC is constantly improving the program through the introduction of new methods and procedures.

Logistics men point out that at the present time all classes of supply (excluding perishable goods) are moving to Korea on a "programmed" basis. Some 83 percent of all goods shipped are moving in accordance with a preconceived plan. Improved vessel utilization, better stowage efficiency, and faster turn-around time has resulted in more supplies being shipped in less time.

The costly Red Ball express (a premium service combining expedited rail and truck delivery to Japanese ports, then by connecting cargo ship to Korea) has been reduced to a minimum.

The establishment of additional ports and unloading beaches in Korea has resulted in a substantial increase in the amount of goods that can be shipped.

Estimated Savings

With the program in full force, approximately 50 percent of all supplies are now programmed from the United States directly to Korea. This direct support results in an estimated savings of $465,000 each month for the taxpayer.

The suspension of expedited service (rail, truck, and ship) made possible through the movement program has resulted in an additional savings of $135,000 a month.

Cargo ships now travel with full holds and carry emergency equipment on top decks. The jam-packed and efficient utilization of all storage space now nets a savings of approximately $215,000 a month.

Totaled together, the savings effected by JLC's programmed movement amount to almost ¾ million dollars each month.

Moreover, logistical support for Korea has become, for the most part, a routine process, whereas prior to programming it consisted of a continuous series of crises.

Our victory in World War II and our successes in Korea were dependent on mobility and fire power. We acquired mobility by having available ample supplies of motor vehicles. While our fire power was dependent on reliable and accurate weapons supplied with adequate quantities of ammunition, it was equally dependent on the means of getting the ammunition to the men who could use it at the time they needed it—the men on the firing line.

General J. Lawton Collins

Why Not Have Cadre Schools?

Major Louis E. Long, *Armor*
Instructor, Command and General Staff College

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

THE Chief of Staff, 20th Infantry Division, has received a directive from Army headquarters. He reads the directive, pales, and then carries it to the commanding general with considerable reluctance. As he expected, the general perused the document hastily and then exclaimed in an anguished voice, "They can't do this to me!"

What are the contents of this directive? Orders directing the general's retirement? A demotion order? No, this document directs that the 20th Infantry Division will assume one of the most undesirable tasks that can be imposed on any commander; namely, to furnish a cadre for a new division.

How will this directive affect the 20th Infantry Division? The division was activated at table of organization strength and is now engaged in basic unit training. Table of organization strength has been maintained and, as a result of energetic action by the division G1 and G3, a program to train critical personnel in depth has been in effect within the division. However, production of a division cadre necessitates the provision of approximately 3,200 individuals or 17 percent of the command. This is nearly the equivalent of one infantry regiment!

Our Present System

A resume of past activation procedures will trace the development of our present cadre system. During World War I, new divisions were activated either by combining existing small units into divisional organizations or by a cadre system similar to that employed during World War II. However, the cadre system used was neither as detailed nor as carefully worked out as that used during World War II.

At the beginning of World War II, plans for creating new divisions were in existence. Activation procedures prior to March 1942 were controlled by General Headquarters, United States Army. Army Ground Forces was formed in March 1942 and was given activation responsibility.

The cadre system in effect during World War II involved designating a parent unit to furnish the complete, or nearly complete, personnel for a new unit. The very complexity of a division precluded furnishing a complete cadre from another division. Certain specialists had to be furnished from other sources. Therefore, furnishing personnel for the activation of a new division required the coordinated action of many headquarters to accomplish the selection, pre-activation training, and assembly of personnel pos-

Adoption of the proposed cadre school system would make it possible to place fully trained units in the field in a shorter time through a reduction in the cadre requirements imposed on units by our present system

sessing the proper military occupational specialties of the various arms and services.

Present plans for the production of cadres are very similar to those employed during World War II. The chart on page 29 illustrates the various sources which furnish the cadre for a new division. This illustration depicts the number of sources involved and accentuates the need for centralized control of these sources.

Current plans also stipulate that units being cadred will receive individuals who have at least completed basic individual training as replacements. It is obvious that these individuals will not replace the trained personnel of the cadre without considerable additional training. Experience has proved that normal administrative losses, changed assignments, and interruptions to training make accomplishment of the training mission very difficult. Why, then, do we make the training task even more arduous by requiring these units to furnish such a large cadre?

Are we sound in our present approach to this problem? The cadre system as developed by General Headquarters, United States Army, in January 1942 provided that 172 officers and 1,190 enlisted men would comprise the cadre of an infantry division. World War II and postwar refinements to this initial plan increased the size of the cadre to approximately 380 officers and 2,805 enlisted men. Despite this great increase in cadre size, our planners still contemplate that a similar unit will furnish the bulk of a cadre for a new unit!

Here we have a problem that should stimulate the imagination of any planner! Enumeration of some more of the disadvantages of the present cadre system will provide a better understanding of the dilemma. During the early days of World War II, some unit commanders, through necessity or for some other reason, used the cadre as a vehicle to pass on undesirables. This practice was eliminated to a degree by requiring units to nominate two cadres, known as "A" and "B," and designating a higher headquarters to make final selection of the cadre to be furnished. The question of cadre *quality* still remains unsolved, however, for the higher headquarters making the final selection can only ensure that the cadre is up to or above the average of the parent unit. The original composition of the parent unit will, therefore, determine the quality of the cadre, with no assurance that the quality will be equal or standard for cadres chosen from different units. Another deterrent to standardized cadre training, under the present system, is the varieties of equipment issued different units. Parent units may not be issued certain types of equipment or may be issued substitute items entirely different from those items issued to the new unit. The cadre, under these conditions, would have to be trained on unfamiliar equipment before they were able to instruct the filler personnel of the new unit.

Present officer cadre procedures utilizing the parent unit, other units, Army Reserve forces, officer pools, schools, and officer candidate schools as sources of officer personnel are adequate and do not involve the difficulty encountered in supplying satisfactory enlisted cadres. The foregoing statement is not intended as a dismissal of the importance of the officer cadre, for it is fully realized that the officer and enlisted cadre form the nucleus of the unit and will exert an influence on that unit in direct proportion to their attitude and training.

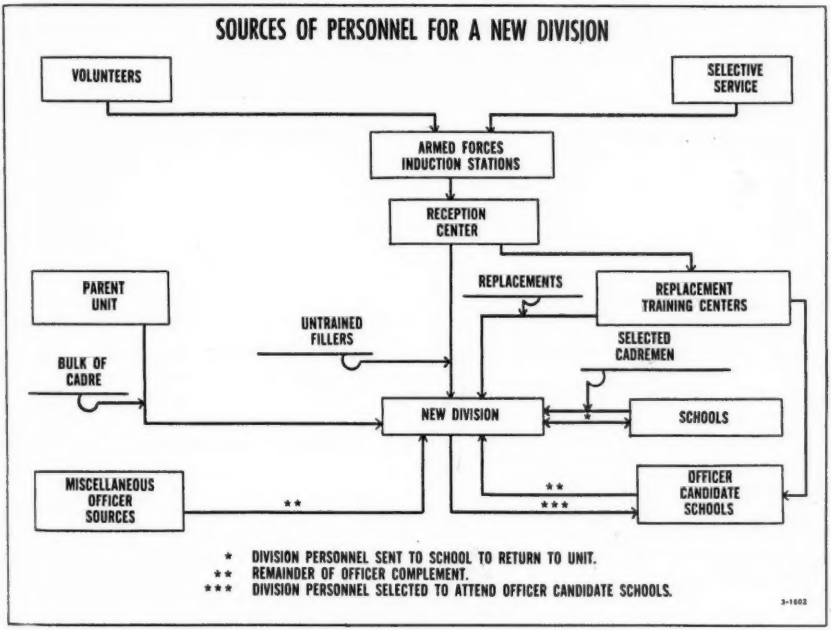
However, the numerous sources available for the selection of the officer cadre as compared with the enlisted cadre assures better selectivity. It is axiomatic, then, that the major problems involved concern the selection and training of the enlisted cadre.

Technical Training

Training experts generally agree that the training of the various technicians required by the growing complexity of our Army is one of the most difficult tasks facing us today. The majority of these technicians must attend one of the service schools for a protracted period in order to acquire the necessary skill to perform their tasks satisfactorily. On the other hand, the enlisted leaders required in a cadre such as platoon sergeants and squad leaders are trained within and by the unit. It follows, then, that it would be easier for a unit to furnish leaders than technicians for a cadre.

Division Cadre Composition

Let us analyze the composition of an infantry division enlisted cadre. Examination discloses that only 870 of the 2,805 enlisted cadre can be classed as leaders—the balance being technicians. Imagine the harm done to any unit that is suddenly directed to furnish 1,935 skilled or semi-skilled individuals. If the parent unit were responsible only for furnishing leaders for the cadre, however, only 5 percent of the command would be lost as compared with the present 15 percent. Furthermore, as was pointed out before, this 5 percent can be trained entirely within the unit.



Cadre Schools

The question immediately arises as to the source of the other required personnel for the cadre. A system of cadre schools may be the answer. The proposed cadre schools would operate as follows:

1. Responsibilities of major headquarters would remain the same as they are under the present system:

a. The Assistant Chief of staff, G1,

Department of the Army, would be responsible for the incorporation of cadre requirements for units on the activation schedule in his over-all schedule of procurement and the allocation of personnel necessary to bring cadres to authorized strength.

b. The Chief, Army Field Forces, would be responsible for the production

A leadership student leading his patrol in a field exercise at Fort Ord, California.

of units and trained individuals, except for certain individuals, units, and activities which are related solely to technical or administrative services, and other Department of the Army agencies but not to the army in the field.

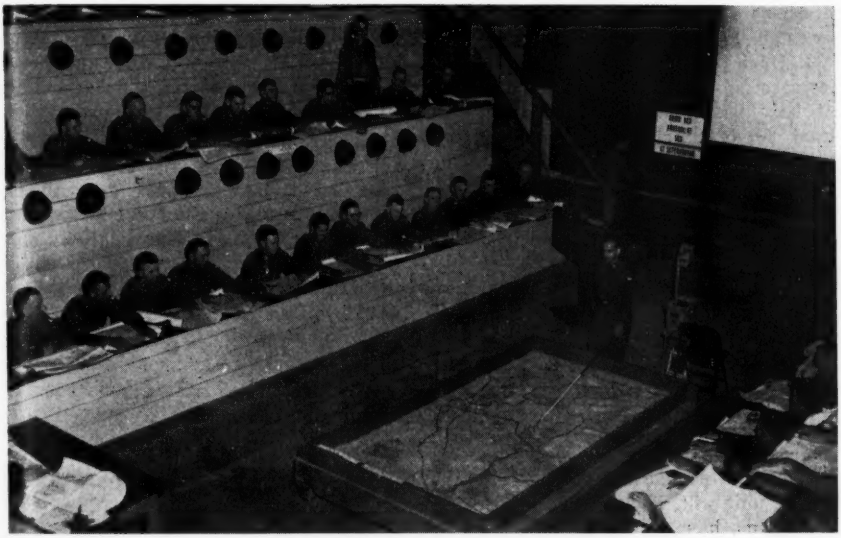
2. Personnel to be members of a cadre would be selected on the following basis:

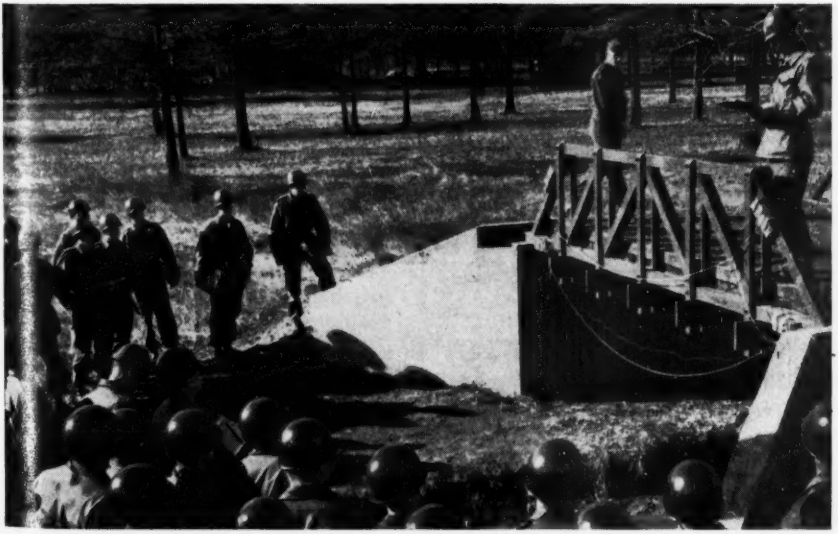
a. Leader personnel would be chosen from a similar type unit in accordance with qualifications stipulated by the Chief, Army Field Forces.

b. Technicians would be chosen from the Army Reserve forces and the replacement stream (the replacement centers would furnish the majority of these individuals). It should be noted that this provision will increase the replacement center's training requirement. Subsequent paragraphs will show that the proposed cadre system contemplates that all individuals selected from replacement centers will complete branch training prior to selection.

3. Training of the cadre would be accomplished at the various service schools. Army Reserve forces personnel would be the primary source of critical specialists that require longer periods of schooling. These individuals could be recalled to active duty sufficiently in advance to receive necessary schooling, whether refresher or regular instruction was necessary prior to the activation date of the new unit. Personnel for technical jobs which require short periods of school instruction would be selected from replacement centers and ordered to service schools upon the completion of branch training (17 weeks). Individuals would be selected for the schools on the basis of their area aptitude scores as well as their demonstrated leadership ability. Leader personnel would also be sent to an appropriate service school to receive instruction in the latest tactics, techniques, and orientation on the newest equipment and weapons.

a. If adequate preference is ensured in selecting cadre personnel, classes of 4 to 6 weeks duration should be sufficient to train other than critical specialist cadre personnel. The service schools would probably require additional personnel to discharge this new mission, however, since the school system must train a large number of these technicians anyway, their normal load would not be increased too much. This action would expand the school to provide sufficient technician replacements for these same





The numerous sources available for the selection of the officer cadre as compared with the enlisted cadre assure a far better selectivity. Above, a group of officer candidates listening as an instructor explains a combat problem. Below, engineer officer candidates learning how to wire a bridge for destruction.—Department of Defense photos.

divisions after they have been committed to combat.

4. Upon completion of training at service schools, the cadre would be assembled at the new unit's activation station at least 30 days prior to activation. This provision, which was in effect during World War II, is of inestimable value. During this period, individuals would be welded into a team and instructional methods and procedures would be developed.

Proposed System's Advantages

Proponents of the present cadre system may contend that the proposed solution does not provide sufficient experience for the cadre of a new unit. This argument loses its merit, however, when consideration is given to the following factors:

1. Leader personnel selected from the parent unit will, in accordance with current plans, have completed unit training with that unit prior to being placed on a cadre and will undoubtedly include many of the individuals from the original cadre for that unit.

2. Careful screening of the Army reserve forces should provide ample experience if civilian skills and former military specialties are considered.

3. Replacement centers will provide a much larger group than is presently available to the unit designated as a parent unit. The resulting greater selectivity should ensure a better caliber of personnel for cadres.

4. The training of all of these individuals at the appropriate service schools will provide more up-to-date and better technical training than could be provided within a unit.

5. The recent addition of a warrant officer in each company or battery to supervise administrative and supply functions decreases the necessity for providing completely qualified enlisted personnel for specialist's positions within these fields.

To summarize, an analysis of the foregoing solution will disclose the following advantages:

1. A higher caliber of personnel selected.

2. Better technical training.

3. Standardized training on the latest equipment and weapons.

4. Reduction of cadre requirements from the parent unit from 15 percent to 5 percent of the command. This will allow the parent unit to retain its technicians and will enable it to meet an earlier combat readiness date.

These advantages more than compensate for any inherent disadvantages. By use of this system, we could provide a more experienced, higher caliber base for new units. We could also be able to place fully trained units in the field within a shorter period of time by reducing cadre requirements for all units by at least 10 percent.

The United States and its allies can never hope to match the strength in the sheer numbers of manpower available to our possible enemies, but we can provide the technical means for our fighting forces so as to offset that numerical superiority.

Brigadier General Charles E. Loucks

McDOWELL'S OFFENSIVE

Lieutenant Colonel Charles E. Welsh, *Artillery*
Instructor, Command and General Staff College

SINCE the world's first battle, men have been searching for a formula in which they can insert the proper factors and arrive at a plan which will ensure success. The writings of soldier scholars fill volumes with principles to be used in the successful plan. The formula, however, eludes them. In examining these writings, a few principles appear consistently and can be applied to most battles. These have been called the principles of war.

From these principles the fundamentals of offensive combat are derived. They have a certain timelessness and have been applied successfully by Alexander, Napoleon, and Ridgway. Failure to apply these fundamentals has contributed to defeats since the first of battles. Blind application will not ensure success, but violation of a fundamental can be made only with considerable danger.

General Irvin McDowell thought he had applied the fundamentals of the offensive correctly when he planned his expedition into Virginia, however, 2 weeks later his army returned, beaten and routed by the Confederate force. What caused the disintegration of this army? During the early stages of a campaign, blame can be laid to poor training, lack of supplies and equipment, and unfamiliarity with the shock of battle. These things were common to both forces. Perhaps, then, a violation of fundamentals contributed to his defeat.

No great battle marks the opening of the American Civil War. Both sides were unprepared for war and could muster only a few security forces. Both the North and the South began an immediate mobilization and four armies took form along the northern borders of Virginia. By 1 July 1861 the situation was as shown in Figure 1.

At that time, pressure from Lincoln's War Cabinet forced General Winfield Scott, Chief of Staff of the Federal Army, to take steps to clear the Confederates from the approaches to Washington. The plan prepared by General McDowell was good, although ambitious, considering the slight superiority of the Federal force. McDowell with his force of 30,000 was to drive south, seize the rail center of Manassas, and defeat General Pierre Beauregard's Confederate army. Success depended on General Robert Patterson holding the Confederate forces under General Johnston in the Shenandoah Valley and preventing them from joining Beauregard.

Responsibility for the entire operation was in the hands of General Scott who approved McDowell's plan and dispatched the orders to Patterson to conduct the secondary effort.

The secondary effort seeks:

1. To hold the enemy in position.

2. To force the enemy to commit his reserves at the wrong time and place.

3. To prevent the enemy from reinforcing the front of the main effort.

Failure to apply the fundamentals of offensive combat has contributed to defeats since the earliest battles. Although blind application will not ensure success, they can be violated only with considerable danger

4. To seize objectives which contribute to the success of the main effort.

Patterson's Mission

To accomplish this purpose the mission sent to General Patterson was "If not strong enough to beat the enemy . . . make demonstrations so as to detain him in the valley of Winchester; but if he retreats in force towards Manassas, and it be too hazardous to follow him, then consider the route via Key's Ferry" (to join McDowell). The elements of a secondary attack are here. "To beat the enemy" is an objective which would contribute to the success of the main effort. "To detain him in the valley of Winchester" would hold the enemy in position and prevent him from reinforcing the front of the main effort. To force the enemy to commit available reserves in this area is certainly implied.

The dangerous part of this order lies in the "ifs" and "consider." The commander of the secondary effort was to be allowed to judge the necessity of the secondary effort. He was given enough "outs" to allow complete compliance with the order without accomplishing the purpose of the secondary effort.

The fault appears to be in the failure to assign Patterson a definite objective. This may have been assumed by General Scott, but was not, however, apparent in the order. What sort of an objective can be assigned?

Every attacking force is assigned an objective by its commander. It may be:

1. A body of troops.
2. A critical terrain feature.
3. A communications center.
4. Any vital area in the hostile rear.

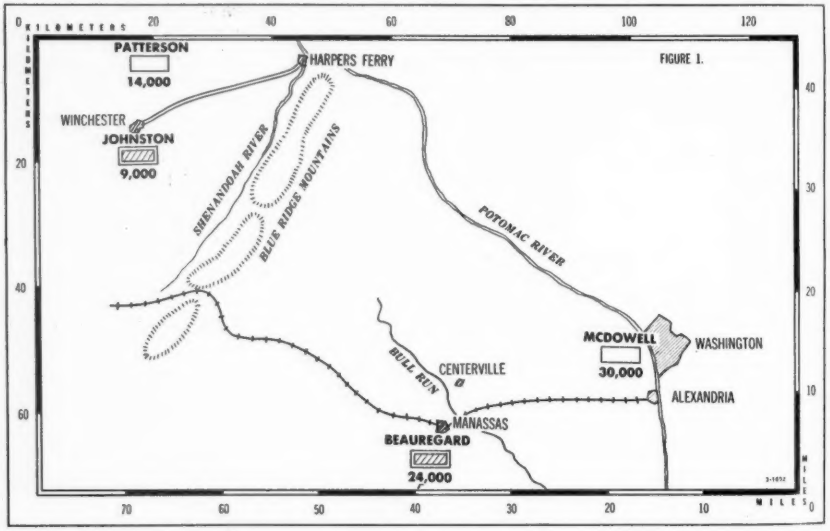


FIGURE 1.

Had Patterson definitely been ordered to seize Winchester and had he energetically carried out this order it is certain that Johnston could not have left the Shenandoah Valley. The fundamentals of the secondary effort would have been satisfied and McDowell's chance of success materially increased.

A body of troops may be properly assigned as an objective. However, there is

a danger for the commander who may become confused as to which body of troops he must defeat. In this case, Patterson was convinced that the Confederate outposts to his front represented the enemy force which he was "detaining in the valley."

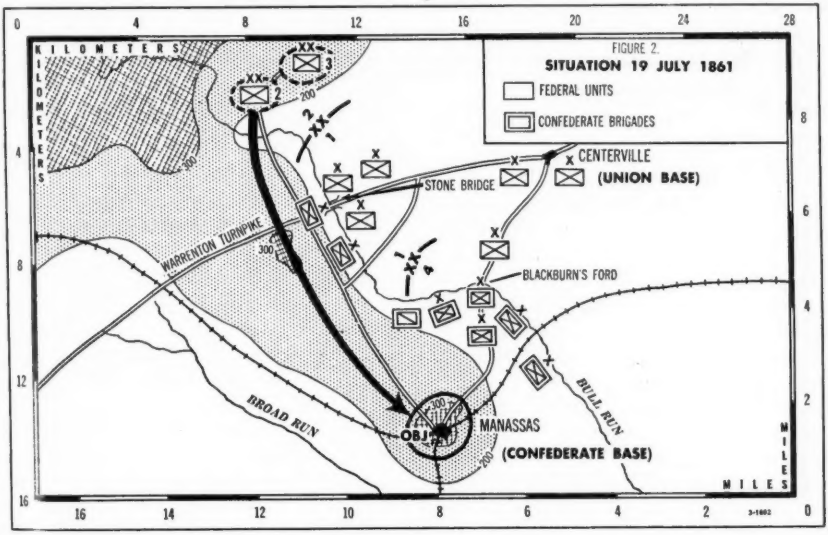
McDowell Advances

On 16 July 1861, General McDowell with his army of 30,000 Federal troops set forth from Washington to drive the Confederates from Manassas, and secure the approaches to Washington. A bulky field order was in the hands of his division commanders.

"The troops will march to the front in the following order." Thus begins McDowell's field order. Although the order is filled with administrative details no clearer statement of the mission is given than "will march to the front." An objective or march objective may have been implied but no indication of this appeared in the order. Some 2½ days later the force succeeded in moving only 20 miles against negligible resistance.

On 18 July, McDowell's troops established solid contact with the Confederate force just south of Centerville along the Bull Run. Here, McDowell halted his army for 2 days. Secure in the belief that Johnston was immobilized in Winchester, he accurately estimated Beauregard's strength and dispositions, carefully made his plans, and deliberately maneuvered his troops for an attack on 21 July.

Disquieting news then arrived from the west. Patterson, after a weak gesture toward Winchester, had withdrawn to the north. There were rumors of unusual activity in Winchester.



McDowell continued his planning and prepared his orders. The attack was to be an envelopment launched with two divisions in column of regiments with the remainder of the army, less two brigades, conducting feints and demonstrations. Two brigades were in army reserve protecting the supply base at Centerville (see Figure 2).

McDowell selected the town of Manassas occupying high ground in the enemy's

rear as his objective. This town with the high ground surrounding it was a critical terrain feature and a communications center of some importance.

An objective should have the following characteristics:

1. Its capture must be possible within the time and space limits imposed.

2. Its capture should either ensure the destruction of the enemy in his position, or the threat of its capture should compel the enemy to evacuate his position.

3. It must be easily identified.

4. Its capture should facilitate future contemplated operations.

Manassas, occupying the high ground that dominated the Confederate position along the Bull Run, would, if seized, certainly cause the destruction of the enemy force or compel him to withdraw. It occupied the most easily identifiable terrain in the area. The only rail line south from Washington entered Manassas; there it branched, one line running through Manassas Gap to the Shenandoah Valley and the other south to Richmond. Therefore, the seizure of this rail junction became vital for future operations of the army to the south and west. It was deep enough in the enemy rear to cause the destruction of his position, yet not too deep to be beyond the capabilities of the main effort.

An Envelopment

McDowell decided to envelop the Confederate northwest flank.

When the enemy takes up a defensive position, the commander of the attacking forces should consider the possibility of turning the enemy out of his position and forcing him to abandon his position and fight on ground more favorable to the attacker.

When the situation does not favor an envelopment, the main attack is directed toward a penetration of the hostile front.

The penetration must be employed when:

1. The enemy's flanks are unassailable.

2. Time is not available to make an envelopment.

The penetration is favored when:

1. The enemy is overextended.

2. Terrain and observation are more favorable to the effective use of combined arms.

McDowell's Errors

At first glance it appears that McDowell properly applied the fundamentals in selecting an envelopment. The enemy was overextended along Bull Run and, therefore, vulnerable to a penetration. However, Federal superiority in infantry and artillery could be more profitably employed in the envelopment along Manassas Ridge, in open ground, than in the low wooded Bull Run Valley. The Confederate flanks were assailable, and it appeared that there was sufficient time to maneuver for the envelopment.

Undue Delay

There was also some justification for employing a penetration. The force under Johnston was only 50 miles from Manassas, and most of this distance could be traveled by rail which was controlled by the Confederates. Johnston could move all of his force to Manassas in less than 24 hours. It took McDowell 2 days to feel out the Confederate flanks and to maneuver his force for the envelopment on 21 July. If the penetration could have been made 2 days earlier, Johnston would have had 2 days less time to reinforce, and the penetration might have been reasonably undertaken.

The Plan

McDowell's order provided for the attack of the main effort across the Bull Run northeast of Stone Bridge, avoiding the enemy position at Stone Bridge and attacking down Manassas Ridge to seize the objective. The secondary effort was to occupy the enemy between Stone Bridge and Blackburn's Ford.

Every attack has a main and secondary effort.

The main effort seeks:

1. To secure the objective.

2. To destroy the enemy force.

In the envelopment:

1. The main effort is directed against the flank or rear of the enemy forces and toward an objective in the rear of his front lines.

2. The secondary effort is directed against the enemy front.

The order here seems correct. He provided for a main and secondary effort and avoided the enemy position with his main effort striking toward the objective in rear of his front lines. He utilized the best terrain approach within the area. The secondary effort was directed frontally against the enemy's main position along Bull Run.

McDowell had four divisions available in the Centerville area. He employed only two of these in the main effort, the 2d Division making the assault in column of regiments with the 3d Division following close behind as support. A minimum of artillery accompanied this force with the bulk of the artillery being employed in the secondary effort.

The main effort is characterized by:

1. **Narrow zones of action.**
2. **Strong fire support of all types.**
3. **Echelonment of reserves.**

The Main Effort

The main effort, on the flank of the army, was given a narrow zone. It entered into action along one road covering little area to the sides. The 3d Division, uncommitted and following close behind, constituted a strong reserve. It appears that McDowell erred in placing too much artillery with the secondary effort. However, the route of the envelopment may have prevented movement of the heavier artillery. In addition, artillery, if properly employed, could have assisted the movement of the main effort from positions north of Bull Run.

The Secondary Effort

The secondary effort consisted of two divisions. One brigade of the 4th Division was ordered to make a "false attack on Blackburn's Ford." The 1st Division was ordered to "move toward the Stone Bridge of the Warrenton Turnpike to feint the main attack upon this point." No physical objective was assigned to either of these divisions.

The secondary effort is usually characterized by:

1. **Attack to seize close-in objectives.**
2. **Minimum essential fire support.**
3. **Essential reserves only.**
4. **Wide zones of action.**
5. **Lack of depth in attacking force.**

The zone of the secondary effort covered about 7½ miles and included an open flank. As planned, two divisions, consisting of six brigades, faced seven Confederate brigades. There was a substantial Confederate superiority on the front of the 4th Division which employed only one brigade against five Confederate brigades within its zone. There is some question whether McDowell employed enough strength in his secondary effort, He did use economy of force, however, and with the strong support of artillery, the secondary effort had a reasonable chance of performing its mission.

The weakness of the secondary effort lies in the mission assigned to the two divisions. Neither division was assigned a physical objective. It is not certain what the accepted meanings of the terms "false attack" and "feint" were at that time. The presently accepted meaning of the term feint is "an attack or demonstration intended to deceive the enemy; a pretended blow." The demonstration does not require an attack but a "show of force implying an attack." The terms feint and demonstration are much the same

with a greater implication or possibility of attack in the case of the feint.

McDowell may have intended an attack but this was not understood by the commanders of the 1st and 4th Divisions. Although the force had "essential reserves only," "wide zone of action," and "lack of depth in the attacking force," there was no attack to seize close-in objectives. The massing of artillery in support of the secondary effort—certainly more than "minimum essential fire support"—may have been justified.

Except for being a little more specific, this order appears much the same as the order given General Patterson.

Reserve Forces

McDowell provided for two reserve forces, the 3d Division which was to follow the 2d Division making the main effort and two brigades of the 4th Division to remain near Centerville to protect the supply base.

In the attack, units are distributed in depth to provide:

1. Flexibility of maneuver.
2. Continuity in the attack.
3. Security.

The location of the 3d Division provided little flexibility. It marched close on the rear of the 2d Division and in column of regiments. It is doubtful if it could have been employed in any area other than in that of the main effort. It did, however, provide for continuity in the attack and security on the northeast flank.

The two brigades of the 4th Division at Centerville were provided for security alone. McDowell's main supply route was the Warrenton Turnpike running from Centerville to Alexandria. This he desired to protect in case of an enemy attack on his southeast flank. In addition, his supply trains had collected around Centerville. However, with 2 days to plan for this attack he could have shifted his supply base to the northwest, thereby obviating the need for such a large reserve for security alone.

Johnston Joins Beauregard

On 20 July, with his troops forming for the attack, McDowell was stunned by the news that Johnston had escaped from the valley and was reinforcing Beauregard. Should the attack be halted or changed? McDowell had properly considered the capability of the enemy to reinforce and felt that his plan was still sound. There were indications that the reinforcing troops were being placed in support behind Blackburn's Ford. This, of course, favored the northeastern envelopment. No, the plan was not to be changed and McDowell pressed the completion of his preparation.

Feint Unconvincing

At 210515 July the 1st Division opened the battle with an artillery barrage on Stone Bridge. Skirmishers were pushed forward and began a desultory fire on the Confederate positions from long range. This fire was rather short-lived and the skirmishers returned to their lines where they began to fell trees and prepare their position as if for defense. This action failed to convince an alert Confederate commander at Stone Bridge who withheld his fire and improved his position on the flank.

The 4th Division made its feint on Blackburn's Ford. However, this also made no impression on the Confederate force located there as no reports of infantry action were reported to the Confederate commander. Furthermore, word was received by General Beauregard that "the enemy in the center and right" (1st and 4th Federal Divisions) "are falling trees as if for defense."

Stone Bridge Abandoned

The Federal main effort led by the 2d Division did not cross the Bull Run until

0900. By this time the feints and false attacks had subsided to light artillery bombardment of the Confederate positions. The Confederate commander at Stone Bridge sighting the columns of dust on his left flank abandoned his position at Stone Bridge and ignoring the inactive 1st Division to his front wheeled his brigade across the high ground to his rear directly in the path of the 2d Division. This maneuver was completed just in time to receive the first attack of the battle. As could be expected from the formation of the main effort, McDowell's crushing blow on the enemy's flank was initiated by one regiment, the lead regiment of the 2d Division. Confusion followed. The 2d Division was spread along the road for several miles, and in order to bring up sufficient force to overwhelm this single brigade much time was lost. In addition, the division commander was killed in attempting personally to place the artillery on the front. In spite of this, however, the attack did have some initial success.

Flank Becomes Front

General Beauregard, somewhat puzzled at first by the action of the Federal troops, was soon convinced by the lack of aggressiveness to his front and the crossing of the Bull Run that "the battle is there." "I am going," he said. Ignoring his front, except for the extreme east flank where he left three brigades, he ordered his remaining troops (including three additional brigades from Winchester) to the west. The resulting meeting engagement ended disastrously for the Federals. As an additional Federal brigade became extricated from the column and committed, it met an additional Confederate brigade, but there were seven Confederate brigades and only five Federal brigades in the main effort. Unable to move forward and weakened by losses, particularly in commanders, the green troops broke and moved in disorder back toward the Potomac. Two divisions of six brigades—more than half of the Federal army—had never been committed to an attack. These divisions fell back to Centerville covering the route of the army.

The Secondary Effort

In this discussion of the First Battle of Manassas, one is struck by the failure of the secondary effort. It is perhaps unfortunate that this is so, for undue emphasis may have been placed on the fundamentals for employment of the secondary effort. In many battles the secondary efforts have been employed admirably with failures in other phases of the battle contributing to defeat. Realizing this, let us review the violations of fundamentals which contributed to McDowell's defeat.

Patterson's Failure

The first and perhaps most dangerous error was not McDowell's. Patterson's force, assigned the secondary effort of the army, failed to "hold the enemy in position and prevent him from reinforcing the front of the main effort," and Johnston escaped from the Shenandoah Valley to reinforce Beauregard. The commander must assign a definite objective and mission to the secondary effort which will ensure that it accomplishes its purpose. For this purpose, a physical terrain objective serves best, as it fixes the commander's attention on a tangible goal, the location and extent of which is not based on conjecture or available intelligence. Patterson should have been ordered to seize Winchester at once. This he may not have been able to do, however, the attempt would have accomplished the purpose of the secondary effort. The fault here lay with Scott who dispatched the ambiguous and vacillating order to Patterson.

Delayed Attack

The second error was the slow move to the south and the delay in attacking the

Bull Run position. Two things could have been done to speed the operation. Definite march objectives could have been assigned elements of the army marching south from Washington. Once committed, the attack should be pursued relentlessly allowing the enemy a minimum of time for rest and reinforcement. A rapid pursuit and early attack could have driven Beauregard to the south or destroyed his force before the arrival of Johnston.

Lack of Intelligence

The third error was not a violation of principle, but rather lack of complete intelligence. McDowell, not realizing that Johnston was moving from the valley, delayed his attack in order to feel out the enemy flanks completely and to manuever for the envelopment. If the penetration could have been made on 19 July, a day before Johnston reinforced Beauregard, it would have been advisable to penetrate as "time was not available to make the envelopment."

No Objective

The fourth error was a repeat of the first. McDowell assigned no objective to his secondary effort. It is possible that a feint, false attack, or demonstration may accomplish the purpose of a secondary effort. However, against an alert enemy it is doubtful if he will be confused for long, unless the "show of force" is followed by a determined attack. This error resulted in immobilizing more than half of McDowell's force for the entire battle.

Security Reserve

The fifth error was the assignment of a large reserve located for security alone. With a shifting of his supply base, some or all of this reserve could have been e ployed in the attack.

Column Formation

The sixth error was the column formation of the main effort force. Depth to the attacking force certainly is desirable, but in this case two divisions were in single column on one road. Any delay at the head of the column caused the entire force to halt. McDowell attempted to correct this by ordering a double column and the use of trails paralleling the road. However, the order came too late, and the lead regiment was already engaged. To compound this error the reserve division was too close to the assault division. This prevented the reserve from being employed at any other location and added to the confusion in the column.

Conclusions

McDowell undoubtedly applied the fundamentals of the offensive as he knew them —but his offensive failed. It would be erroneous to state that any one of his errors caused his defeat, however, it is certain that his collective errors brought about his failure.

While principles and fundamentals have been violated in many battles which ultimately have been successful, each violation has increased the risk of the operation. Fundamentals should be violated only when the commander has a thorough knowledge of the possible consequences and of the stakes involved.

Principles and fundamentals are a guide for the successful conduct of battle—a guide in which any violation must be carefully considered and evaluated in the light of its possible results.

Unresolved Problems of Ordnance

Doctor Constance McL. Green

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

THE end of fighting in World War II found the Research and Development Service of the Ordnance Department of the Army with several hundred projects underway and scores of problems still unsolved. The long list of specific questions that had arisen during the war and still remained unanswered showed not lack of energy or of imagination on the part of Ordnance engineers but rather the complex interrelationship of factors to be considered in any major development as well as the vastness of the realm of applicable science still scarcely explored.

That neither Ordnance specialists nor scientists of the National Defense Research Committee had learned, for example, what made the behavior of a shaped charge predictable must be recognized as the consequence of a limited knowledge of aerodynamics, explosives chemistry, and physics generally. In time, such phenomena could either be analyzed and sorted out into categories in which comprehended natural laws applied or be relegated to the area of natural forces usable but not understood.

In view of the tremendous facilities for scientific investigation in the United States, Americans could safely cherish the belief that problems solvable by scientific research would be dealt with here as quickly, or more quickly, than in any other country in the world. That such a program might take years could cause no profound dismay, since, in the competition with other nations that underlies war, scientific progress in foreign countries might outstrip the United States in some particular applications but surely could not keep pace with the United States in others. German science had preceded the allies in the development of guided missiles, but (providentially for the armies fighting the Axis) had lagged far behind in making possible the employment of proximity fuzes.

The Problems

Comforting though these reflections might be in the long view, for the Ordnance Department the series of problems which were unresolved on VJ-day constituted an abiding challenge. The problems were of two kinds; first, those requiring patient investigation of means of improving any given weapon, and, second, those involving matters of tactical usage, logistics, and the basic theories of how a citizen's army should be equipped. To cite a single example of the first kind, research into ways of producing a longer-range, accurate, and more powerful rocket to be fired from a shoulder launcher was a project calling for extensive postwar work. Far more fundamental were those controversial questions arising from conflicting views concerning what types of weapon modern warfare demanded. The

The long list of unanswered Ordnance questions indicates not only the complex interrelationship of factors to be considered in any major development but the vastness of applicable science still to be explored

Ordnance Department had no voice in the final decisions. Yet, its opinion carried more weight at the end of the war than in 1941, before experience had lent force to the Ordnance line of reasoning.

Standard or Special Purpose?

Global war had manifested the undesirability of having a single type of weapon for universal use. Thus, the Ordnance Department learned that to limit the design of tanks—whether light or medium—to one standard pattern was to court disaster. Wide tracks were needed to give flotation in mud and swamps in some actions; narrower tracks and less powerful engines were adequate in others. Rubber tracks gave better service over paved roads and smooth surfaces while steel tracks were all but essential for rocky terrain or coral reefs. However, acceptance of variations of design did not settle the argument of whether many thinly armored, lightly gunned combat vehicles were more valuable than fewer very heavy tanks which were harder to ship and much more expensive to build and operate.

Years after VJ-day the proponents of the lumbering, powerful heavy tank were to encounter occasionally the criticism that the United States Army had let itself be overmechanized.

Still, granting the wisdom of adaptations of some features of a weapon to give the versatility required for effective use under various conditions of combat, climate, and terrain, the question remained whether multiplicity of design did not create more problems than it solved. Quite apart from any difficulties in production, the supply of special spare parts for and the training of troops in the use of a variety of weapons might make the drawbacks outweigh the advantages.

The Ordnance Department's largely successful effort to make all ammunition of a given caliber usable in any model of any type of gun of a similar caliber paid off again and again. The less successful endeavor to have parts for vehicles interchangeable between one make and another convinced Ordnance automotive engineers that uniformity of mechanisms was vitally important. Yet, within the Ordnance Department as in the Army at large, differences of opinion endured over whether to place emphasis upon multipurpose weapons or on special equipment for special purposes. The visible effectiveness of the German 88-mm gun as a field artillery piece, an antitank weapon, and an antiaircraft gun inspired the design features of the "triple-threat" American 90-mm gun which resulted in a series of compromises which made the gun less well-suited to any one of the three uses than would otherwise have been possible.

Cyclic Rate versus Weight

What constituted the most essential features of infantry weapons was a matter of argument throughout the war. The fast cyclic rate and 30-round magazine of the 8½-pound M3 submachine gun provided the infantryman or paratrooper with a spray of fire, but prevented his aiming his shots carefully. Conversely, the Browning automatic rifle (BAR), although capable of short bursts at an even higher cyclic rate, had only a 20-round magazine and, with its bipod, weighed more than 19 pounds. However, it could achieve an accuracy unobtainable with the more portable "submachine" gun and had twice the range. The question then arose whether the scatter-fire of the lighter short-range weapon was more useful than the accurate longer-range fire of the heavier weapon.

The attempts to copy a very lightweight German machine gun and a machine pistol seemed wasted effort to men who believed the .30-caliber Browning machine gun and the BAR the best weapons foot soldiers on the move could have. Troops advancing through the villages and

wooded stretches of Lorraine and the Ardennes found reassurance in the sound of their submachine guns rattling away at the scattered enemy, but the fact that nearly every unit carried more BARs than were listed on the tables of equipment testifies to the faith American soldiers placed upon the heavier weapon. True, an infantry company might be given a diversity of small arms so that the BARs of some squads could supplement the submachine guns and rifles of others.

Weight versus Accuracy

How much of a factor should the weight of a weapon be considered in infantry equipment was a question as controversial as that of aimed fire versus area fire. The M1 rifle gave the infantryman a weapon of greater power than the short-ranged carbine but saddled him with more than 4 pounds additional weight. Which was more important for the individual soldier, the utmost mobility and least possible fatigue, or more, longer-range, killing power, and, hence, greater self-confidence? The Ordnance Research and Development Service, neither able nor invited to give a categorical answer, could only strive to develop infantry weapons combining light weight and power more satisfactorily than the enemy had done.

The importance of achieving light weight and sturdy equipment was heightened, moreover, by the growing role of air warfare and the introduction of the parachute technique of dropping men and supplies behind enemy lines. But obviously, material that would survive parachuting, or delivery by glider, still must possess lethal characteristics if it were to be of any use. A serviceable airborne tank had not been developed before VJ-day, and even the 105-mm airborne howitzer, because of its reduced range, proved less valuable than its designers had hoped.

Whether extensive recourse to night fighting demanded special equipment not only for bombers but for ground troops was another moot question. Although some 60 vehicles equipped with powerful searchlights (canal defense light vehicles) had seen service in night crossings of the Roer River, the possibilities of the "illuminated front," later hotly debated in Korea, had received little attention in 1944 and 1945. One of the great assets of proximity fuzes lay in their uncanny capacity to find the enemy in darkness as well as in light, but whether infrared rays, for example, could be effectively used on vehicles was a matter for further study. Although the Corps of Engineers had primary responsibility for infrared applications, Ordnance assistance was enlisted on the problem. On VJ-day its future was uncertain.

Material Shortages

The logistical and tactical considerations to be borne in mind in determining what length of life American weapons should have were never fully evaluated during World War II. Shortages of tungsten, chromium, molybdenum, rubber, and a dozen other materials caused the Ordnance Department to find substitutes even at the expense of producing less long-wearing items—it was usually necessity that changed the specifications. Nevertheless, as the war progressed, the observant could see the logic of using stamped metal parts in place of forgings, or a wide variety of cheap, readily worked materials in lieu of more durable but more expensive kinds. German and Soviet infantry weapons proved that inexpensive short-lived articles, producible at fractional cost and, therefore, cheaply replaceable, served the purpose adequately. The American M3 submachine gun, with most of its parts stamped out of sheet metal, was one application of the new realization that great durability was not necessarily a vital requirement for any small weapon.

However, while tacitly admitting the validity of the thesis in the case of small

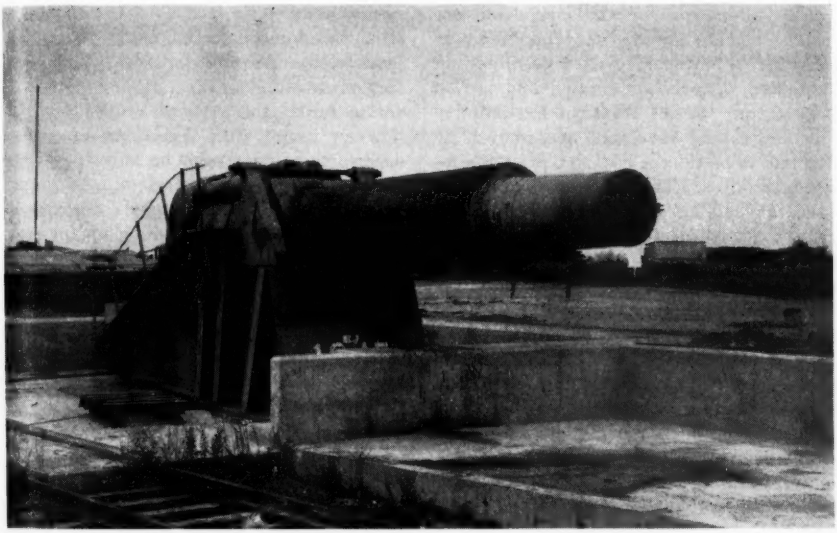
arms, the General Staff and the Ordnance Department were far less persuaded of the soundness of the principle applied to more complex items. When replacement parts must be shipped half-way around the world, the cost of having equipment wear out needlessly fast was naturally too high to contemplate. On the other hand, enemy fire could demolish, in a moment, matériel with years of life left in it. Unlike machines designed to run until deliberately scrapped, weapons of war are constantly subject to destruction long before they wear out. The Germans put the *Panther* tank into action with an engine requiring replacement after, at most, 625 miles of travel, whereas *Sherman* engines were known to have a life of more than 3,000 miles. Advantageous though the greater endurance must be, if achieved without sacrifice of essential features and without large additional expense or slowing of quantity production, the reasonable chance that enemy fire would destroy the tank before the engine had lived out its life made its durability a somewhat doubtful asset. The Soviet Army, like the German, accepted matériel with a service life span far below what the American Army demanded. In the Soviet view, usable, albeit makeshift, equipment was good enough to be blown up. However, in the United States, the century-old concept of building military equipment to last at least through an entire war was too deeply ingrained to be readily cast off. The question of what items were best made as cheaply as possible, with scant regard to service life, was one which the Ordnance Department was only beginning to study at the end of World War II.

Equally fundamental was the question of overelaboration versus oversimplification of military equipment. Improvisations in the field often did a job as well as a device carefully worked out on the drawing board and the production line. When the Research and Development staff in Washington learned that American soldiers in the jungles of the Pacific islands had been sticking razor blades into tree trunks to prevent Japanese snipers, who had infiltrated through the lines at night, from climbing up the trees, draftsmen immediately began to make drawings of a device by which a bristle of knife blades could be clamped to a tree trunk. A commercial company, under contract, produced several experimental versions of this gadget before the scheme was vetoed as quite needless. More bizarre and amusing than significant, this episode exemplified a growing tendency to gild the lily of simplicity on the one hand, and to develop and nurture the extremely elaborate on the other.

Special Training

When armies had been supplied only with rifles, bayonets, revolvers, sabres, cannon and howitzers, mortars, hand grenades, or even with machine guns, it was relatively easy to design, manufacture, and keep the weapons in usable condition. Training soldiers to use these weapons properly was correspondingly simple. When World War I inaugurated both air and tank warfare, the task became more complex, and by the end of World War II the advances of science made the possible applications to military usage so infinitely various as to tempt the general staffs of all countries to junk earlier types of killing devices.

Just as the single-shot rifle was largely superseded by the semiautomatic, and the revolver by the semiautomatic carbine or the submachine gun, so artillery fire control instruments directed by eye, hand, and pre-figured firing tables were replaced by highly intricate electrical computers, frequently fed data by radar. To train soldiers in the use of such equipment and to teach crews to maintain it meant lengthy courses of instruction meticulously planned and executed.



The new weapons used at the end of World War II—the *V-2* rocket, proximity fuzes, and the atom bomb—introduced elements of confusion concerning an all-embracing armament plan. Above, a 24-inch test gun, part of Ordnance's research work. Below, soldiers loading the Army's new 280-mm "atomic" cannon.—Department of Defense photos.

Any Soviet peasant trooper could see in a moment how to use the "Molotov cocktail," a bottle filled with gasoline and stoppered with a rag, lighted and hurled into a tank to set it afire. Preliminary schooling would have been necessary if he had had to be taught how to use a proximity fuze on a rocket. Nor was the better-educated soldier of the American Army always ready to make use of new equipment, advance instruction in its employment notwithstanding. Thus, the patience, ingenuity, and money spent in the United States on developing gyrostabilizers for tank guns proved largely wasted until late in the war. Tank crews, finding them more trouble than they were worth, usually disconnected them. When they were used, specially trained maintenance teams had to adjust and repair them at frequent intervals, with the consequence that most armored units, unless specially trained, preferred tanks minus this refinement.

If the United States Army must count on having little more than a year in which to prepare draftees for military service, dare it rely on equipping its forces with weapons so complicated that the high school graduates composing the citizens' army could comprehend the principles of the employment and care of only a very few items? Might the dangers inherent in this kind of specialization not exceed any benefits? Although these were not questions for the Ordnance Department to answer alone, they were problems the Nation's military establishment must face before an intelligently planned development program could be established for the future.

Cost and Affect

Hand-in-hand with these questions ran the matter of over-all costs in both money and materials for complex new weapons. The American people at the opening of World War II, bred in the belief that our natural resources were, if not inexhaustible, at least ample for immediate national needs, had been unprepared to accept the idea that some matériel might be too expensive to use, and that less than perfection must do. The Soviets put into action tanks, the exterior finish of which was so rough that American engineers deemed them unsuitable because they were less likely to cause a projectile to glance off than would the rounded contours of the American tank. The provision for crew comfort within American combat vehicles had no counterpart in Soviet-built tanks. Here, to be sure, the argument lay in the relative value of unfatigued crews versus cheaper tanks. Yet, World War II experience forced recognition of the possibility that American design and fabrication were refined to the point of extravagance. A German general, comparing Soviet and American tanks, told American officers: "In my opinion, your Western tank is much too complicated, much too expensive."

After the war military tacticians were startled by the dollars and cents aspect of wider use of proximity fuzes in place of impact or time fuzes; when inquiry revealed that the cost differential was close to 10 to 1, the plea for issue of a larger proportion of influence fuzes was withdrawn.

In the heat of combat, soldiers naturally forgot that they were taxpayers as well as fighting men, but the Ordnance Research and Development staff realized that they must keep costs in mind when planning new weapons. One of its officers told a committee of the Bureau of the Budget ". . . we are almost as interested in Dun and Bradstreet as we are in American men of science." The balance to be maintained between the armament program and the national economy as a whole had, of course, to be determined by national policy. For the Ordnance Research and Development Division, the problem remained of how to carry out any policy when finally settled.

An Evaluation of Needs

The swiftness with which combat conditions and doctrines of tactical employment of weapons shifted in World War II naturally made carefully thought-out tables of equipment extremely difficult to compile and revise. Piecemeal standardization of items from 1940 onward multiplied models from which to choose matériel for any particular type of engagement, but the War Department had made no thorough over-all study of what a modern army would need since the Westervelt Board report had been completed in 1919. By early 1943, the Ordnance Department believed that a careful reappraisal was overdue and a comprehensive survey of the necessary modern gun power and armor to win the European campaign was needed. Although, in late 1943 and during 1944, several special missions brought back a series of recommendations, the comprehensive survey wanted by the Ordnance Department had to wait until after the war.

Postwar Evaluation

The upshot was inevitable, not only considerable waste effort spent during the war on specific developments requested by the using arms and then cancelled before results could be tried, but, after the war, a tangle of conflicting views about what projects should be pursued and fitted into an all-embracing armament plan. The new weapons employed in the last year of fighting—the Axis' dreaded *V-2* rocket, the proximity fuzes, and, above all, the atom bomb—unavoidably introduced elements of confusion. Why expend time and money on improving conventional weapons which were likely to be outmoded at the drop of a hat or an atom bomb? To offer an extreme illustration, the hints in 1950 and 1951 that warfare was about to be revolutionized by the use of long-range artillery, firing an atomic warhead, tended to raise questions of the utility of such a weapon as the 914-mm mortar. While the effect of these rumors was lessened by newsmen's judgment that "this kind of atomic artillery is still only a gleam in the Army's eye," the pressure of public opinion and Congressional inquiry made Ordnance Research and Development planning more difficult. At the beginning of the postwar era, uncertainty left the Ordnance Department with no logically constructed long-range program of development to follow. Not until the War Department Equipment Board report appeared, at the end of May 1946, was over-all guidance available to any technical service.

Wartime Achievements

Achievements during the war had exceded the most optimistic hopes of men familiar with the obstacles to overcome in designing military equipment. Science, allied as never before with military research and development, had sent weapons into action that rivaled Buck Rogers' extravagancies. However, if much of the development program had been haphazard, Ordnance committee attempts at co-ordination notwithstanding, the fundamental difficulty was more subtle. What is needed is a clearer differentiation of the respective roles of the pure scientist, the design engineer, and the technician engaged in testing and modifying the products of the first two. "The world," said Brigadier General Leslie E. Simon, in speaking of the applications of science, "muddled through by random processes rather than through the application of purposive procedure."

Perhaps John Dewey's pronouncement on adjusting to life could be applied to devising ways to kill:

> If ever we are to be governed by intelligence, not by things and by words, science must have something to say about what we do, and not merely about how we may do it most easily and economically.

NAVAL MINES

Colonel Paul L. Bates, *Armor*
Instructor, Command and General Staff College

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or the Command and General Staff College.—The Editor.

A SHORT article appearing in the November 1948 issue of the MILITARY REVIEW, excerpted from *The New York Times*, stated that despite intensive minesweeping by allied navies since the end of World War II more than 200 ships had been sunk or damaged subsequent to VJ-day. Knowing that the allied minesweeping potential during the latter stages of World War II was the greatest that it had ever been, and that charts must have been available for most of the mine fields, why had that many losses occurred?

Some of the losses were caused by mines that broke loose and floated into shipping lanes, but in some instances ship captains were either badly informed or disregarded warnings and took short cuts through mined waters. The greatest losses, however, were caused by the fact that no adequate sweeping methods had been developed which would remove the types of mines employed during World War II. These mines will be discussed in more detail later.

World War II Statistics

How serious was the mine problem in World War II? Statistics reveal that British mines alone sank 1,050 Axis ships and damaged 540 exclusive of her efforts in Asiatic waters. This was accomplished with a loss of 7 minelaying ships, 2 minelaying submarines, and about 500 aircraft. Approximately 76,000 mines were laid, and the majority of the Axis ships lost to mines were credited to mines which were laid by aircraft.

The Germans, on the other hand, are believed to have laid more than 120,000 mines by aircraft, submarines, and surface craft. As a result, the British lost 281 warships, and 296 merchant vessels, for a total loss to German mines of 577 ships.

The mining effort by the United States against Japan began in earnest in March 1945. Twentieth Air Force *B-29s* began a campaign designed to end Japanese coastal shipping, and succeeded in mining all of the important Japanese and Korean seaports. As a result of this effort, more than 670,000 tons of Japanese shipping was lost, and the Japanese were never able to clear the clogged channels.

What, then, must be considered, concerning mine warfare, in any future conflict? Besides the direct losses in ships sunk or damaged, other considerations are: the diversion of sea-borne traffic; delays caused by harbor and canal closures; the necessity of committing large numbers of men, material, and ships to minesweeping operations; the development of new minesweeping equipment and techniques; and the reduction in the speed of vessels following minesweepers are all factors which will affect the tactical and strategic planning in any future war.

History of Mine Warfare

The naval mine was invented during the Revolutionary War, and its use was first demonstrated by David Bushnell in 1777. It was further developed by Robert Ful-

ton in 1797 and named Fulton's "torpedo," but interest languished in the United States until the Civil War, at which time "torpedoes" were used extensively in several crude forms for harbor defense. Notable publicity was obtained during the battle of Mobile Bay when one ironclad was sunk and others altered course until warned by Admiral Farragut from his flagship in words alleged to be "Damn the torpedoes! Go ahead, full speed!" No other ships were damaged in this operation, even though several struck mines which failed to detonate because they had corroded firing mechanisms.

Although interest in naval mines lagged after the Civil War, an accelerated program of development and production began during World War I. The United States Navy participated in the British program and assisted them in laying the North Sea barrage.

Between World War I and World War II, there was little interest shown in the development of this weapon, and no large stocks of mines were maintained by the United States.

The Soviet Union

Russia early revealed an interest in naval mines and used them successfully during the Crimean War for the defenses of Sevastopol, Sveaborg, and Kronshtadt. In 1904, in the Russo-Japanese War, both sides used mines freely.

The Soviet Union has consistently maintained large stock piles of mines, and all types of ships are armed with them. Her major seaports and her extensive navigable rivers and canals compel the Soviets to take an active interest in both defensive and offensive mine warfare.

After World War II, the Soviet Union obtained all types of German mines and mine accessories, as well as some of Germany's best mine warfare technicians and manufacturing establishments.

Germany

Germany's interest paralleled the Soviet Union's, however, she exceeded the Soviets in technological improvements. While writers of various nationalities dispute Germany's right to the claim of discovery of some improvements or new developments, none seems to contest the fact that Germany was the first to produce these improved versions in sufficient quantity for effective wartime employment.

In addition to the development of mines, minesweepers and minelayers also were developed which enhanced Germany's mining capabilities.

Great Britain

Prior to World War I, Great Britain stocked about 4,000 mines and studied various foreign types. When the war began, the production of mines was limited, and it was not until 1917 that authority to produce 100,000 mines was obtained.

Major British efforts during World War I were: to close the North Sea between Scapa Flow and Norway, in conjunction with the United States; the partial blocking of the English Channel; and the countermining of German defensive fields.

After World War I, interest in mining lagged, although both the acoustic and magnetic mines were known by the British, and this fact greatly aided the development of countermeasures for these weapons in World War II.

Britain's mining position at the start

Unless the minesweeping potential of the United States and its allies is improved, and means to eliminate the latest types of mines are devised, plans which otherwise would be feasible will become impracticable

of World War II had as its principal assets a large accumulation of experience, a practical recognition of the mine menace, an excellent reservoir of technicians, and a wide variety of numerous ships and craft which could be modified readily for laying and sweeping mines. By a prodigious effort, Britain produced sufficient mines, modified ships and small craft, and developed techniques which enabled her to counter the German mining effort and later to take the offensive.

Other Countries

Other belligerent maritime nations showed only an interest in defensive mining and were responsible for few developments of significance. Most of these countries maintained only a small stock of mines, and these were usually purchased abroad.

Types of Mines

Mines are classified as fixed, floating, or ground types (see Figure 1). Fixed mines, as the name implies, are fastened to an anchor by a cable of constant length that holds it at a preselected depth. The extreme depth at which this type can be employed is approximately 100 fathoms. It can be used successfully only in localities where there is little tide or current, as movement of any consequence causes the mines to depress, thus permitting ships to ride safely over them. Fixed mines can be detonated by contact, or fired from a shore station in addition to a variety of other methods.

Floating mines move freely, either singly or in clusters, on the surface or at a preselected depth. However, this is the least profitable way to employ mines although the use of this type in rivers and canals, where ships, locks, and bridges offer multiple targets, may have fairly good chances of success.

Ground mines rest on the bottom, or ground. Of the three types, this one is the newest and most difficult to sweep. When dropped in a harbor, river, canal, or other area which is subject to silting, or which has a soft bottom, it is soon buried with mud making its detection and location almost impossible. This burial, however, has little effect on its lethal capabilities.

Methods of Actuation

Contact was the earliest means devised for detonating mines. Detonation occurs when a ship comes in contact with the mine case, protruding horns, antennae, or extending snag lines.

During World War II, influence mines were perfected and used, first by the Germans, and later by Great Britain and the United States. These mines are actuated by a change in the physical characteristics of the area surrounding the mines. The first type used was the magnetic mine which takes advantage of the natural magnetic field which surrounds a ship and which is employed to attract the mine to the ship.

The acoustic mine was a later development. This type uses a simple hydrophone to pick up the ships propulsion sound. Desired frequency and duration of the sound can be varied to match that of the anticipated targets.

The last type which was utilized was the pressure mine. This type uses changes in water pressure caused by the motion of a passing ship to actuate it.

Two or three influences may be used together in a single mine, and in combination with contact. These influences increase the probability of detonation at the desired time.

Mine Accessories

The development of accessories which improve the capabilities of the mines has progressed with the development of the mines. These include:

1. Explosive charges to break the trav-

eling cables of minesweepers, and sprocket wheels to avoid these same cables.

2. Ship counters which permit the passage of a selected number of ships before the mine is armed. This is a good method of countering sweepers and of obtaining surprise.

3. Delayed arming devices which permit the passage of neutralizing minesweepers before the mine is armed.

4. Sterilizers to render the mine harmless at a selected date, thus preventing its interference in an area which friendly forces intend to utilize later.

5. Booby traps to prevent examination of mines which fall into enemy hands.

6. Self-destroying mechanisms which actuate if the mine is air-dropped and falls on land.

Mines can be laid by almost any type of surface ship, submarine, or aircraft. For sea areas under our control, surface ships are the most satisfactory, because of the large number of mines a ship can carry, and the ability to place the mine accurately in selected locations. If the mines are to be laid clandestinely, submarines are the best layers. For areas under enemy control, aircraft are the most effective.

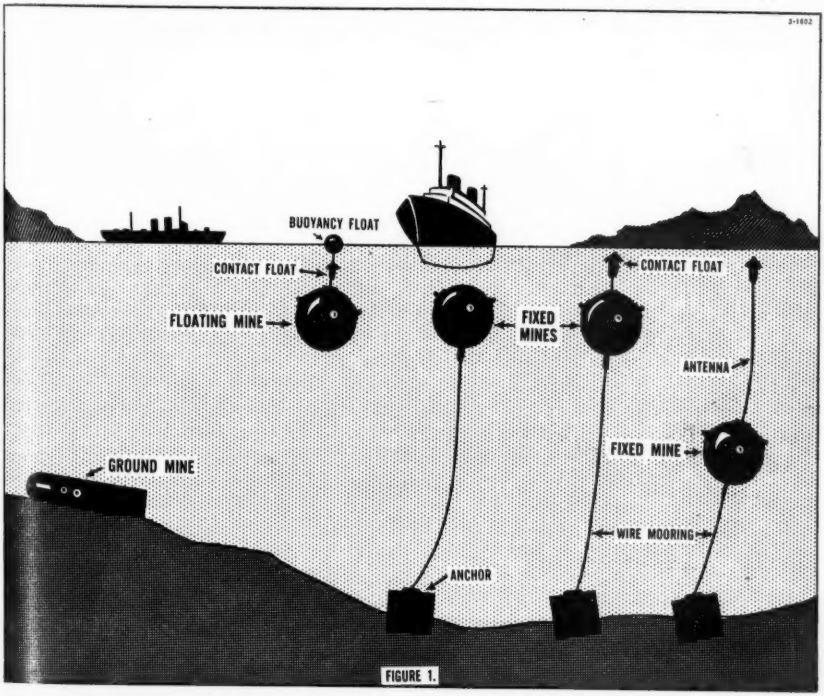


FIGURE 1.

Analyses have shown that in World War II the mine was the most effective antishipping weapon used by aircraft, and that the losses of aircraft for each enemy ship lost were lower than in other forms of attack. Both Navy and Air Force planes were employed by the United States in World War II for this purpose.

The original magnetic mines dropped by German aircraft in November 1939 were 8 feet long, weighed 1,200 pounds, and had a magnetic field extending 30 feet. They contained 650 pounds of explosive and were capable of breaking a large ship in two. Later British models were made smaller, so that the average aircraft was capable of carrying 12. These British mines could be free dropped from an altitude of 200 feet.

The "tally" on the minesweeper *Incredible* shows 38 mines destroyed in Korean waters.

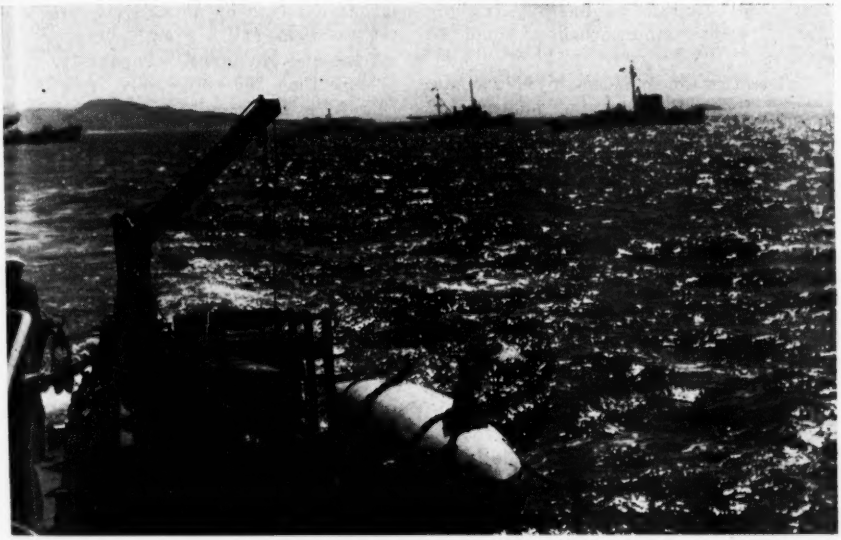
Methods of Removal

Mine location and removal, during the period when only moored mines were used, was both difficult and dangerous. Sweeping consisted of a ship towing one or two paravanes attached to cables. These would snag the mine cable and slide a cutter against it severing the mine from its mooring. After it rose to the surface it was destroyed by gunfire. Among the dangers of this operation was the possibility that the sweeper, rather than the towed cable, would strike a mine.

With the advent of the ground mine and its accessories, sweeping became infinitely more difficult and dangerous. Approximately 20,000 men and 1,000 ships were required during World War II to counter German mining efforts in the vicinity of the British Isles before British losses could be reduced to acceptable proportions. It is estimated that the Germans employed twice this number. The varieties of mines, and the methods of actuating them, required several sweeps by differently equipped special sweepers before an area was reasonably safe.

The first ground mines employed by the Germans were of the magnetic influence type, dropped by parachute from aircraft into British rivers and harbors. A particularly fortunate aspect of these attacks was that early in the operation one landed in very shallow water in the Thames estuary. This mine was recovered, analyzed, and countermeasures were developed which permitted traffic to move within acceptable limits of risk.

The countermeasures consisted primarily of providing ships with degaussing cables which prevented the mine from actuating. This was a time-consuming, expensive operation which required frequent testing of the ships to assure the efficiency of the system. It was not the complete answer for several reasons; most important of which was that, after passage of a ship, the mine remained as a hazard. Moreover, the system was not completely effective in shallow water. Actual removal of the mine was the only sure countermeasure, and such removal was usually achieved by towing magnetic cables which detonated the mine. With a large number of coast watchers and radar to plot the mines' positions, when



Mine location and removal are both difficult and dangerous. Minesweepers, towing paravanes, sever the mine from its mooring and then destroy it when it surfaces. Above, minesweepers in action off the Korean coast. Below, a naval ordnance officer inspecting a beached Japanese mine prior to destroying it.—Department of Defense photos.

they were dropped in narrow, friendly waters, good countermeasures could be effected.

Later, the Germans employed acoustic ground mines. The ground mines were countered by towing noise makers in the water, and by searching for the mines with deep sea divers and underwater demolition teams wherever watchers heard a splash or saw a mine fall.

Pressure mines were the last type of influence mine used in World War II. Their location and destruction or removal remains an almost unsolved problem. Electronic means for locating such mines offers little promise, as this method does not discriminate adequately between numerous similar objects on the ground. As previously mentioned, the muddy bottoms of waterways, together with silting, conceal, but do not neutralize, the mine. Artificial wave making and the towing of large objects to create changes in pressure have been tried, but with many limitations because of the time required for sweeping, and the expensive construction and short life of the devices. The Burney method of paravane sweeping is useless. Explosive charges dropped in the water were used by the Germans, but this method is extremely expensive.

When different methods of actuation are used in combination in a single mine, and mine accessories are added, the scope of the problem becomes apparent.

Success in World War II

A brief resumé of some of World War II successes will serve to emphasize the importance of this type of warfare to both the Army and the Navy.

Mines sank more ships for each dollar invested than any other weapon. This was accomplished in spite of the fact that the Germans, who first developed and used the most effective types, largely nullified their advantage by premature employment in small numbers. By the time larger numbers of mines were available, the Germans had a greatly reduced submarine and air offensive capability.

More than 200 ships were sunk in the Danube by 1,200 mines laid by aircraft. Eleven mines laid in the Kiel Canal by light bomber aircraft in April 1944 were estimated to have resulted in a virtual loss to the enemy of more than a million metric tons of cargo, even though not one ship was sunk.

In 1941, it was reported that German planes based at Crete dropped acoustic mines in the Suez Canal which sank three ships and forced the closing of the canal for several days. The canal was considered unreliable, and cargoes had to be unloaded and moved overland by rail for a considerable period of time.

Harbors, canals, inland seas, river approaches to harbors, and probable amphibious landing beaches were the principal areas of employment. One special use of significance was the establishing of flanking mine barriers during the Normandy landing operations to protect shipping from surface and subsurface attack.

World War II Conclusions

With the outbreak of World War II, only Germany and the Soviet Union possessed large stocks of mines, and only Germany had the capability for offensive action. With this capability she severely hindered Great Britain's sea power, closed the entrance to the Baltic, and diverted a considerable portion of British industrial capacity and manpower to counter the mining effort. Rivalry and jealousy between the German Air Force and the Navy precluded maximum realization of the mining potential through a resultant failure to allocate the required aircraft.

The compromising of the newest type mines by premature employment in inadequate numbers permitted the development of countermeasures before the newest mines could attain most effective surprise.

Later, the destruction of the German bomber force eliminated the most profitable method of laying mines.

Germany's concentration of her effort on the British Isles, and the Japanese failure to exploit fully their mining capability, left the United States with a freedom of movement she will probably never again enjoy.

Mines are limited in their employment to water areas under 100 fathoms deep, but ships have to use these depths before arriving at a destination.

Moored mines were used most extensively, and while being the easiest to sweep required a large diversion of strength for this purpose. The cost of sweeping is very high in comparison with the cost of the mines.

The sealing off of the Baltic with mines, and control of the air by the Germans, the ability to interdict the Soviet Union's northern ports from Norway, and Turkish control of the Dardanelles precluded effective use of the Soviet Union's surface laying capability. The USSR's lack of sufficient numbers of bombers and crews which had been trained for mine laying held the Soviet capability to a minimum.

	Mine-sweepers	*Auxiliary Mine-sweepers*	*Minesweepers under construction*	*Mine-layers*	*Auxiliary Mine-layers*	*Subma-rines*	*Submarines under construction*
UNITED STATES	120	112	106	10	6	194	13
SOVIET UNION	142	89	0	13	0	370	120*
GREAT BRITAIN	60	142	41	12	0	53	0
FRANCE	11	27	16	0	0	19	6
NETHERLANDS	27	3	0	1	0	7	4
BELGIUM	6	7	0	0	0	0	0
TURKEY	13	0	0	5	0	11	0
ITALY	0	17	12	0	0	0	0
AUSTRALIA	32	0	32	0	0	0	0
CANADA	12	0	14	0	0	0	0
NORWAY	20	0	0	2	0	9	0
DENMARK	4	28	0	2	0	3	0

* Includes 2 fast (25K) minelaying type

FIGURE 2.

A glance at Figure 2, and a reasonable familiarity with Soviet bomber strength, reveals present Soviet awareness of both the potentialities and capabilities of mine warfare.

The mine, by its very nature, tends in peacetime (the USSR excepted) to fall within the province of the technician rather than the planner. This tendency

must be resisted if the weapon is to be exploited fully and countered effectively when the times comes.

The solution to the sweeping of pressure mines, and certain types of magnetic mines designed for use in shallow water, has yet to be evolved.

With regards to methods of actuation, we have seen that three of the characteristics possessed by most ships have so far been exploited either singly or in combination and with lethal accessories. It requires a minimum of technical knowledge to realize that there are various other methods which might be used for the actuation of an influence type mine. National security precludes reference to this subject in detail.

A glance at a hydrographic chart of United States coastal waters reveals that the east coast and the Gulf of Mexico have large areas inside the 100 fathom curve. Faced with an aggressor having a large number of submarines, a sizable bomber force, and an effective fifth column, the use of mines offers a near paralyzing capability. This ability is further amplified so long as the modern submarine retains its advantage over antisubmarine operations. If this same aggressor possesses a large stock pile of mines, sizable medium bomber forces, and a large number of coastal submarines and small craft, the approaches to shore lines he controls will be particularly dangerous.

Of prime importance is prior preparation for intercepting minelayers or destruction of their bases, and the removal or destruction of the mines after they are laid. The following quotation from the September 1952 issue of the UNITED STATES NAVAL INSTITUTE PROCEEDINGS is significant:

> . . . Too few naval officers realize the number of sweeping units, expressed in terms of operating sweep-units-hours per day, which would be required to keep open the Chesapeake Bay-Hampton Roads area in the face of an aggressive modern mining effort . . . A much larger share of our overall naval effort must be devoted to mine warfare than was ever allocated to mine warfare in the past.

The statistics in Figure 2, taken from *Jane's Fighting Ships 1952*, show the number of minesweepers, auxiliariy minesweepers, minelayers, auxiliary minelayers, and submarines available to each of the principal countries of the world; and include figures on minesweepers and submarines under construction by these countries.

It is apparent that the minesweeping capabilities of the United States and its probable allies are completely inadequate when the length of the coast lines, the canals, the navigable rivers, and the number of harbors are considered. Until the minesweeping capabilities of the United States and its allies improve, all plans involving critical waterways must be organized on a flexible basis to permit the imposition of short-term variations on long-term plans.

Conclusion

While an aggressor would require an almost astronomical number of mines and an almost unlimited number of minelayers of all types to effect closure of all United States ports, and at the same time defend his own areas, there exists, nevertheless, the capability of denying critical areas or effecting great delay within some of the preferred areas of operations.

This is of great importance to the army planner, for unless the sweeping potential of the United States and its allies is improved, and means to eliminate the latest types of mines are devised, plans otherwise feasible will become impracticable. There may be delays in clearing ships from our own ports with critical supplies, and delays in making captured foreign ports usable. Such delays, coupled with an aggressor's replenishment operations, may well defeat an otherwise perfectly planned campaign.

Operation 'Jackpot'

Civil Defense Within the Army Establishment

Lieutenant Colonel Arthur J. DeLuca, *Infantry*
Instructor, Command and General Staff College

THE Department of the Army is responsible for passive defense plans, preparations, and measures for installations of the Army establishment.—Army Regulation 500-70, *Emergency Employment of Army Resources.*

Many of our large cities are now prepared to meet disaster conditions resulting from atomic attacks and our tactical commanders know how to meet the situation if it should arise in the combat zone. The quotation above presents another aspect of this subject which merits the attention of all military commanders.

Let us consider the essential principles of civil defense planning for cities and combat before attempting to describe the subject of this article. Those plans and preparations which are designed to meet disaster conditions in our cities are conceived by *civilians* and will be executed by *civilians.* The military responsibility for civil defense in this instance is one of supporting the needs of the civilian agencies where possible without jeopardizing the military's primary mission. The plans and preparations conceived by the tactical commander, however, will be executed by the military personnel within the combat area. On the other hand, the commander of a military installation may, and in some cases should, prepare plans employing the fundamental principles of civil defense which will be executed by *both civilians and military.* The material which follows presents a solution to this particular application of civil defense principles which was evolved by the armed forces stationed in Panama. Its application, however, is not limited to that area; it may serve as a guide in other areas where similar conditions exist.

Responsibility and Command

Early in 1951, the Commander in Chief, Caribbean Command, directed the Commanding General, United States Army, Panama Area, to prepare plans designed to minimize the effects of a disaster within the military installations of the Panama Area, to organize and to train all military personnel in accordance with these plans, and to conduct exercises designed to test these plans. At the same time, he appointed one Army, Navy, and Air Force officer in the area as permanent members of a newly created staff with the Army member serving as director. This organization he designated as the Joint Disaster Control Staff.

In accordance with his directive, the Commanding General, United States Army, Panama Area, established a Disaster Control Center composed of the permanent members of the staff and technical staff officers of the three major services within the Panama Area, and directed that all of the disaster control activities be supervised through this center.

Although civil defense is not normally considered to be a military responsibility, it becomes one when a military installation itself is the target of an enemy attack or otherwise becomes the scene of a disaster

must be resisted if the weapon is to be exploited fully and countered effectively when the times comes.

The solution to the sweeping of pressure mines, and certain types of magnetic mines designed for use in shallow water, has yet to be evolved.

With regards to methods of actuation, we have seen that three of the characteristics possessed by most ships have so far been exploited either singly or in combination and with lethal accessories. It requires a minimum of technical knowledge to realize that there are various other methods which might be used for the actuation of an influence type mine. National security precludes reference to this subject in detail.

A glance at a hydrographic chart of United States coastal waters reveals that the east coast and the Gulf of Mexico have large areas inside the 100 fathom curve. Faced with an aggressor having a large number of submarines, a sizable bomber force, and an effective fifth column, the use of mines offers a near paralyzing capability. This ability is further amplified so long as the modern submarine retains its advantage over antisubmarine operations. If this same aggressor possesses a large stock pile of mines, sizable medium bomber forces, and a large number of coastal submarines and small craft, the approaches to shore lines he controls will be particularly dangerous.

Of prime importance is prior preparation for intercepting minelayers or destruction of their bases, and the removal or destruction of the mines after they are laid. The following quotation from the September 1952 issue of the UNITED STATES NAVAL INSTITUTE PROCEEDINGS is significant:

> . . . Too few naval officers realize the number of sweeping units, expressed in terms of operating sweep-units-hours per day, which would be required to keep open the Chesapeake Bay-Hampton Roads area in the face of an aggressive modern mining effort . . . A much larger share of our overall naval effort must be devoted to mine warfare than was ever allocated to mine warfare in the past.

The statistics in Figure 2, taken from *Jane's Fighting Ships 1952*, show the number of minesweepers, auxiliariy minesweepers, minelayers, auxiliary minelayers, and submarines available to each of the principal countries of the world; and include figures on minesweepers and submarines under construction by these countries.

It is apparent that the minesweeping capabilities of the United States and its probable allies are completely inadequate when the length of the coast lines, the canals, the navigable rivers, and the number of harbors are considered. Until the minesweeping capabilities of the United States and its allies improve, all plans involving critical waterways must be organized on a flexible basis to permit the imposition of short-term variations on long-term plans.

Conclusion

While an aggressor would require an almost astronomical number of mines and an almost unlimited number of minelayers of all types to effect closure of all United States ports, and at the same time defend his own areas, there exists, nevertheless, the capability of denying critical areas or effecting great delay within some of the preferred areas of operations.

This is of great importance to the army planner, for unless the sweeping potential of the United States and its allies is improved, and means to eliminate the latest types of mines are devised, plans otherwise feasible will become impracticable. There may be delays in clearing ships from our own ports with critical supplies, and delays in making captured foreign ports usable. Such delays, coupled with an aggressor's replenishment operations, may well defeat an otherwise perfectly planned campaign.

Operation 'Jackpot'

Civil Defense Within the Army Establishment

Lieutenant Colonel Arthur J. DeLuca, *Infantry*
Instructor, Command and General Staff College

THE Department of the Army is responsible for passive defense plans, preparations, and measures for installations of the Army establishment.—Army Regulation 500-70, *Emergency Employment of Army Resources.*

Many of our large cities are now prepared to meet disaster conditions resulting from atomic attacks and our tactical commanders know how to meet the situation if it should arise in the combat zone. The quotation above presents another aspect of this subject which merits the attention of all military commanders.

Let us consider the essential principles of civil defense planning for cities and combat before attempting to describe the subject of this article. Those plans and preparations which are designed to meet disaster conditions in our cities are conceived by *civilians* and will be executed by *civilians.* The military responsibility for civil defense in this instance is one of supporting the needs of the civilian agencies where possible without jeopardizing the military's primary mission. The plans and preparations conceived by the tactical commander, however, will be executed by the military personnel within the combat area. On the other hand, the commander of a military installation may, and in some cases should, prepare plans employing the fundamental principles of civil defense which will be executed by *both civilians and military.* The material which follows presents a solution to this particular application of civil defense principles which was evolved by the armed forces stationed in Panama. Its application, however, is not limited to that area; it may serve as a guide in other areas where similar conditions exist.

Responsibility and Command

Early in 1951, the Commander in Chief, Caribbean Command, directed the Commanding General, United States Army, Panama Area, to prepare plans designed to minimize the effects of a disaster within the military installations of the Panama Area, to organize and to train all military personnel in accordance with these plans, and to conduct exercises designed to test these plans. At the same time, he appointed one Army, Navy, and Air Force officer in the area as permanent members of a newly created staff with the Army member serving as director. This organization he designated as the Joint Disaster Control Staff.

In accordance with his directive, the Commanding General, United States Army, Panama Area, established a Disaster Control Center composed of the permanent members of the staff and technical staff officers of the three major services within the Panama Area, and directed that all of the disaster control activities be supervised through this center.

Although civil defense is not normally considered to be a military responsibility, it becomes one when a military installation itself is the target of an enemy attack or otherwise becomes the scene of a disaster

Plans and Organization

Initial planning was based upon target analyses prepared by the technical staff officers. Target areas were assumed and studied in relation to the existing communications, population, utilities, number and types of buildings, and terrain. Each staff officer then established the requirements to be met within his particular technical service field. In addition, each staff officer prepared operational procedures to meet his requirements in consonance with other technical operations.

To implement the plan, the Joint Disaster Control Staff organized the Panama Area into 12 Disaster Control Zones—generally speaking, the military posts themselves. Each zone had a commander, a training officer, and a medical officer. Technical officers were made available to each zone commander to assist him.

Within each zone, a specified number of teams were formed and trained by the zone commander in first aid, monitoring, fire fighting, treatment and holding station, and transportation. The teams were composed of military personnel stationed in the zone, dependents residing within the zone, and civilians employed by the armed forces.

The first great training task was the training of military dependents. Because participation was on a strictly volunteer basis, progress in organizing the desired number and types of teams and achieving training standards was difficult. Training the emergency fire fighters and monitoring teams was accomplished in the Joint Damage Control School. Civilians, who formed heavy-rescue teams, for example, were "on-the-job" workers employed by the armed forces. They operated bulldozers, cranes, and other heavy equipment, and they also manned the usual fire-fighting equipment within each military post.

During the training period, the Joint Disaster Control Staff and the zone

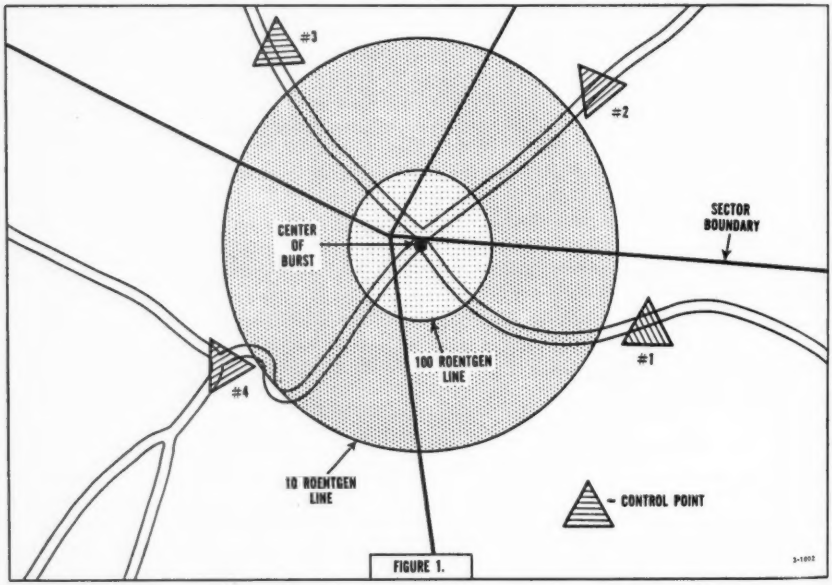


FIGURE 1.

ZONES	AUTOMATIC WAVE NUMBER AND TYPE TEAMS				REPORT TO CONTROL POINT NUMBER	ESTIMATED TIME OF ARRIVAL AT CONTROL POINT (MINUTES AFTER BURST)	DOES ZONE OPERATE A TREATMENT HOLDING STATION?	DOES ZONE OPERATE A PERSONNEL DECONTAMINATION STATION?
	FIRST AID	LIGHT RESCUE	MONITOR	HEAVY RESCUE				
RODMAN	3	1	2	1	3	20	YES	YES
KOBBE	3	1	1		3	35	NO	NO
COROZAL			2		1	15	YES	YES
CURUNDU	3		1		1	40	NO	NO
AMADOR	2	1			1	50	NO	NO
ALBROOK	5	1	1	1	2	40	YES	YES
QUARRY HEIGHTS	1		1		2	55	NO	NO
COCO SOLO	4	1	1		4	120	YES	YES
GULICK	3	1	1		4	120	NO	NO
DAVIS	1		2	1	4	130	NO	NO
SHERMAN	1	1	1		4	160	NO	NO

FIGURE 2.

3-1802

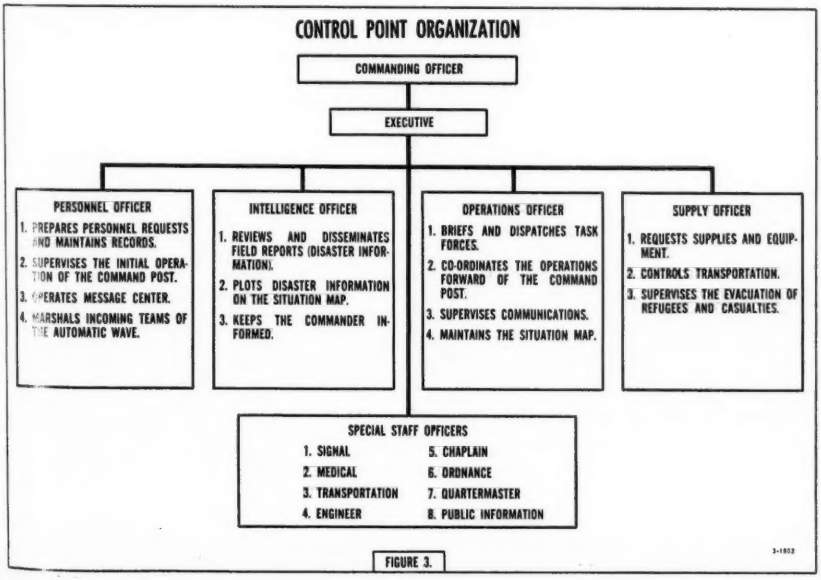


FIGURE 3.

3-1802

commanders conducted command post exercises designed to familiarize the members of the staff with the concept of operations as well as to provide detailed rehearsals of prescribed actions. Zone commanders, in turn, prepared and conducted training exercises for team participation.

A full-scale field exercise, Operation *Jackpot*, culminated the training by combining the actions of the Disaster Control Center, all tactical headquarters, disaster zone commanders, and all teams. A total of more than 4,000 persons participated in this exercise, 1,700 of whom were female volunteers. An area was selected as the hypothetical target. Those military units located within the selected target area who would be casualties were administratively "wiped out" prior to the exercise and performed as "casualties." They were spotted throughout the disaster area prior to the start of the exercise, each soldier wearing a tag which described his type of injury or condition. Printed signs, old cars, and chemical grenades were used to indicate damaged buildings, destroyed bridges, overturned cars, and fires.

A tactical situation was introduced into the exercise to determine what conflicts would arise between tactical and disaster requirements.

An umpire staff evaluated the feasibility of the initial disaster plans during the conduct of the exercise and provided recommendations for the final plans.

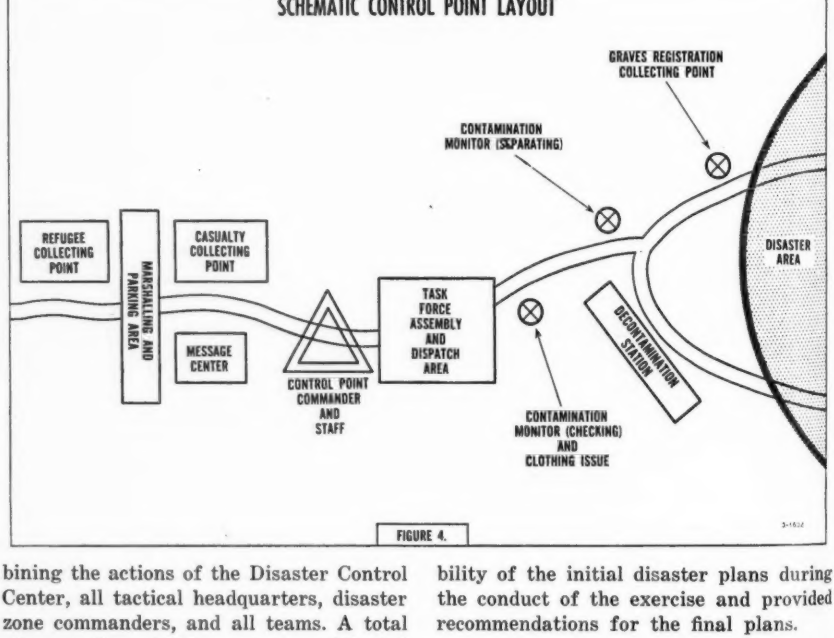


FIGURE 4.

Concept of Operations

Operations were aimed at effecting maximum rescue and minimizing property damage during the first 10 hours. To accomplish this, all initial action was automatic in its execution, and only the immediate knowledge that an atomic disaster had occurred was necessary for individuals to implement the disaster plans.

In accordance with the automatic action

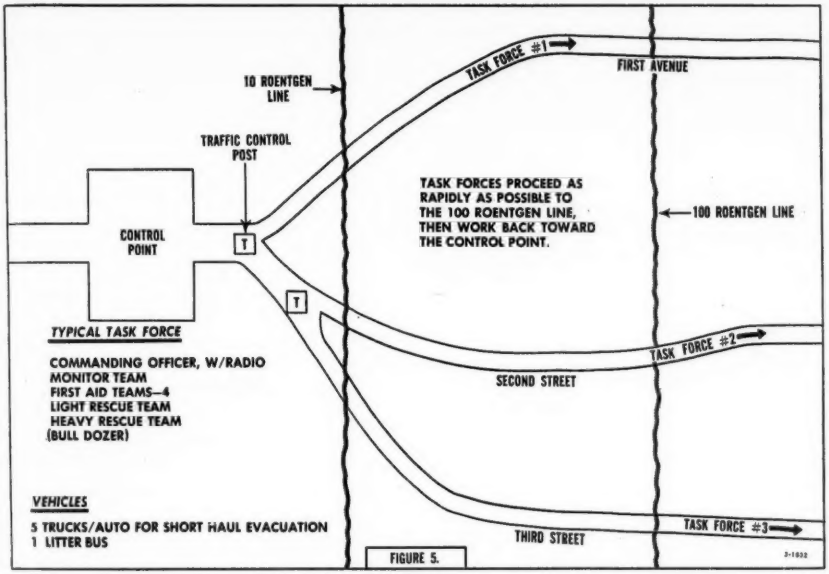


FIGURE 5.

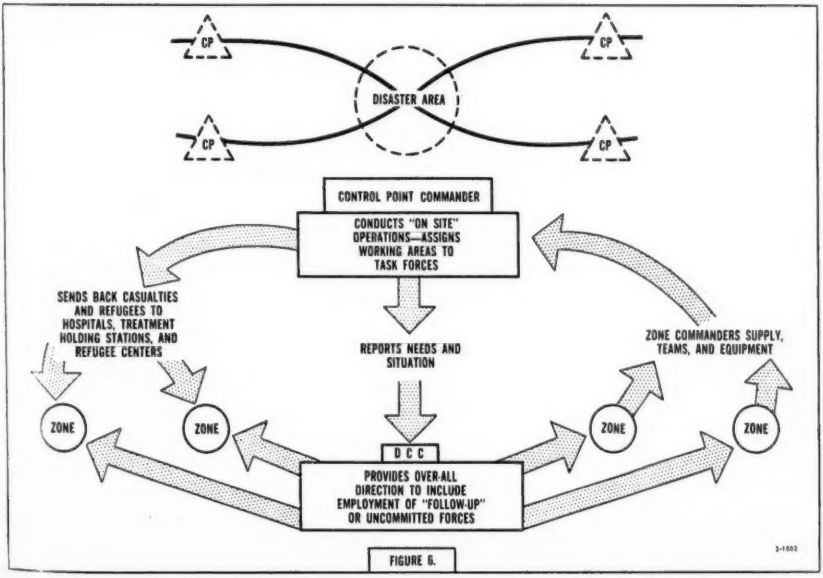


FIGURE 6.

plan, commanders and staffs established control points at logical avenues of approach into the target area for "on site" operations. The plans stated which disaster control zone provided the control point commander as well as the types and numbers of relief teams that formed what was designated as "the automatic wave." Figure 1 shows the concept of a target area subdivided into sectors and general location of control points. Figure 2 is a sample chart showing the relief team requirements in the automatic wave for the assumed target.

The exercise proved that standard command post organization and staff procedures could be successfully applied at the control points. Figures 3 and 4 show how the control points were organized and how they functioned.

As the various teams of the automatic wave arrived at the control point, the commander organized them into task forces and dispatched them into his assigned sector. The scope of operations included on-the-spot first aid treatment, evacuation of casualties, control of refugees, property damage control, immediate utilities repair, monitoring to the 100 Roentgen per day line, and decontamination. The major difficulties included overcoming large fires, blocked roads, lack of water, and panic and confusion among personnel who were near the disaster area. The time goal for completion of evacuation of living casualties was set at 4 hours. Figure 5 is a schematic diagram which depicts the employment of a typical task force.

The Disaster Control Center provided over-all control which included:

1. The allocation of follow-up waves (about 90 percent of total disaster force).

2. The co-ordination of operations through control point commanders.

3. The evacuation from control points to rear areas (see Figure 6).

Conclusions

Originally, zones were to function as independent disaster operating agencies. However, this concept soon proved to be erroneous since the effects of an atomic burst are so widespread that relief must be applied on an area-wide basis rather than on a zone basis. Therefore, operations were later designed to enable zones to act as supply and support agencies, which would enable the personnel of undamaged zones to converge upon the general disaster area to provide relief.

Detailed studies of the full-scale field exercise later revealed that the tactical and disaster functions should be merged, with G3 assuming general staff supervision. Although the tactical headquarters must be prepared to execute its primary mission, it cannot divorce itself from civil defense operations. It was found that the technical chiefs, in particular, were hampered in meeting their tactical requirements because they were absorbed in civil defense problems at the Disaster Control Center. Moreover, the director of the center was required to go through command channels in order to receive the necessary assistance from military units which were not a part of his organization. These major deficiencies will be eliminated when disaster control functions are placed within the normal command chain.

Finally, there was complete agreement among all military personnel who planned and conducted Operation *Jackpot* that *civilians and military* can be employed as a working team to meet disaster conditions that may arise in a situation such as this, provided the direction comes from the highest tactical headquarters in the area, and accepted tactical principles are applied, especially in the fields of evacuation and hospitalization, and refugee control.

MILITARY NOTES AROUND THE WORLD

UNITED STATES

Metal Conservation

Army studies in the redesign of mechanical equipment, use of less critical materials, and adjusted specifications have conserved 333,000 pounds of copper, 900,000 pounds of nickel, 378,000 pounds of aluminum, and 21,000 pounds of tin during the past year.—News release.

Wire Splicer

A new-type splicer, expected to cut to less than 30 seconds the time needed to repair telegraph and telephone wires at the battle front, has been developed for the Army.

Under the old system of wire repair, the repairman had to scrape off insulation from both broken ends of wire, tie the strands in a square knot, and then wind the splice with rubber tape. To ensure a good connection, the splice was then wrapped with friction tape. The repair, at best, took 3 to 4 minutes.

With the new tool, the repairman inserts the broken ends into a wire cutter and stripper, attached to the handle of the instrument. He then squeezes the gadget and a built-in guide assures that the right amount of wire is cut as he feeds bare wire into each end of a connector. One more squeeze of the instrument and the job is finished.—*The New York Times.*

Atomic Cannon

An artillery unit at Fort Sill, Oklahoma, is being trained in the firing of atomic shells in preparation for tests this spring at the Atomic Energy Commission Proving Grounds in Nevada (MILITARY REVIEW, Jan 1953, p 65).

No nuclear shells will be fired at the Fort Sill artillery range, but crews will learn the techniques, with one group especially prepared for the Nevada tests.—News release.

Army Helicopters

The Army announced recently that it plans to buy more of the large and powerful type of helicopters and fewer of the light ones.

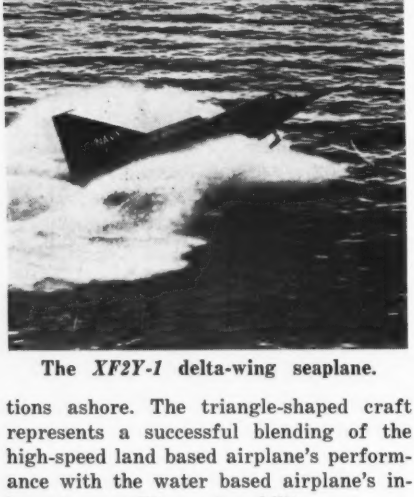
At the present time, the Army is buying only light helicopters, capable of lifting up to 3,000 pounds, because larger ones are not yet available. Eventually, the Army wants three-fourths of its helicopters to be of the 6,000-pound size, capable of handling rations, ammunition, and the 105-mm howitzer.

Plans call for 10 percent of the Army's helicopters to be of the heavy-lift 20,000-pound variety. They would be used to move trucks past road blocks or destroyed bridges, and on other tactical and logistical missions.—News release.

Delta-Wing Seaplane

The world's first delta-wing seaplane —the *XF2Y-1 Sea-Dart*, an experimental jet aircraft built for the United States Navy—recently began its preflight trials.

It is a high-speed, fighter-type seaplane designed to expand the air defense perimeter of fleets at sea and installations ashore. The triangle-shaped craft represents a successful blending of the high-speed land based airplane's performance with the water based airplane's inherent versatility and mobility.



The *XF2Y-1* delta-wing seaplane.

The new seaplane has no horizontal tail, but is equipped with a triangle-shaped vertical fin and rudder. "Elevons" on the wings' trailing edges replace conventional ailerons and elevators for control action. To provide better rough water landing and take-off characteristics, the *XF2Y-1* is equipped with hydro-skis (MILITARY REVIEW, Mar 1953, p 63). This marks the first application of the hydro-ski to a combat-type aircraft in this country, and may well be the first such application in the world.

All details of performance are classified for security reasons.—News release.

Safety Record

The Strategic Air Command announced recently that 1952 was its best year from the standpoint of flying safety.

The command averaged 18 accidents for every 100,000 hours flown, 40 percent lower than in 1951. Moreover, the accident rate was cut in the face of a 17 percent increase in flying time during 1952, transition to new types of aircraft, and training of new and inexperienced personnel.—News release.

Triangulation Tower

A lightweight, air-transportable triangulation tower, which can be erected at heights varying from 37 to 103 feet in less than a day by an experienced five-man crew, has been developed by the Army.

Made of aluminum, its structural members weigh only 3,617 pounds—3,020 pounds less than the standard World War II steel tower of the same height. Complete with two sets of anchors, platforms, extra bolts, and a chest for small parts, the entire ensemble weighs 4,152 pounds.

Dismantled, the new tower can be transported easily in a standard Army 2½-ton truck and can be dropped from a helicopter to troops in inaccessible areas without suffering extensive damage.

The new structure, whose longest member is 14 feet and heaviest member but 60 pounds, is actually two mutually independent towers in one. The inner tripod is fitted with an instrument table while the outer one (113 feet high) serves as a working platform for the observer and his recorder, and as a support for signal lamps used as targets. The tripods are completely separated to prevent the surveyor's movements from disturbing the delicate adjustments of the instrument on the inner tower.

Developed for use in military surveys, the tower has undergone stability, rigidity, and air-drop tests to meet military requirements.—News release.

Military Air Transport Service

During 1952, military and contract aircraft of the Military Air Transport Service's Pacific airlift averaged a crossing of the Pacific every 45 minutes. A crossing of the Atlantic or an artic flight was averaged every 75 minutes by MATS during 1952.

In accomplishing the airlift of high-priority military passengers and cargo for the armed forces over 115,000 miles of air routes, MATS aircraft spanned all but one of the world's continents (Australia) and averaged during every hour of the year the airlift of 10 tons of cargo, 7 medical patients, and 58 military passengers.—News release.

Rocket-Fuel Chemical

By shooting high-frequency electric current through ammonia gas, chemists at the University of Utah have produced hydrazine, a chemical source of rocket fuel and the tuberculosis drug isoniazid.

Formerly produced by chemical means only, hydrazine had to be dehydrated by expensive and difficult methods. The new dry process may open the way to manufacture hydrazine on a commercial scale. —*Popular Mechanics Magazine.*

Altitude Test Chamber

A United States aircraft company has completed construction on a new altitude test chamber, described as the largest in the country and possibly in the world.

The new "altichamber" was designed to simulate altitudes up to 70,000 feet, but has achieved the equivalent of 100,000 feet. In addition, the chamber has a temperature range of 100 degrees below zero to 165 degrees above zero.

The altitude test chamber is expected to provide answers to many of the functional problems faced when aircraft equipment is operated under conditions of extreme heat, cold, altitude, or humidity. —News release.

Antisubmarine Airplane

The Grumman *S2F-1*—the Navy's newest antisubmarine airplane—recently completed its first flight.

The twin-engine *S2F-1* is the first carrier aircraft combining the elements of submarine search and attack in one airplane. Its equipment includes the most modern detection gear to hunt out enemy underseas craft. In addition, this new

The Navy's new "sub-killer"—the *S2F-1*.

submarine killer carries the latest submarine destruction devices developed through years of naval experience in operation against enemy submarines. For the performance of these missions the *S2F-1* requires a crew of four.

The Navy's standard antisubmarine aircraft up to the present has been the Grumman *Guardian*. Produced as a "hunter-killer" team of two airplanes, one *Guardian* is equipped to seek out and the other to destroy enemy submarines. The *S2F-1* performs both missions.

An outstanding feature of the new antisubmarine plane is its ability to operate under the most severe weather conditions. This is made possible by incorporating in its design the latest navigational and weather equipment available in the aircraft industry.

No other information has been released on the new plane for reasons of military security.—News release.

Jet Trainer

The Air Force has awarded a contract for the development of a twin-jet primary training aircraft designated by the manufacturer as the Cessna *Model 318*. The new plane will be the first jet trainer, designed as such, to be developed for the Air Force. Jet pilot training is now given in combat aircraft or modifications of combat types.

Design drawing of the *Model 318* trainer.

The design proposal provides for a lightweight, all-metal, single-wing aircraft, incorporating two-place, side-by-side seating, and powered by two 900-pound-thrust, centrifugal-flow, turbojet engines. The aircraft will also be equipped with a fully retractable tricycle landing gear.

According to the preliminary design, wing span of the new trainer will be 33 feet; length 27 feet 1 inch; and height 9 feet 10 inches. Design gross weight will be approximately 5,600 pounds. The plane is expected to have a top speed of more than 350 knots.—News release.

Supersonic Bombers

The Air Force has asked United States aircraft manufacturers to work up detailed plans for new supersonic bombers.

The Air Force already has ordered into production a subsonic bomber, the long-range eight-jet *B-52*.—News release.

Recoilless Rifles

A big hole in the infantry division's antitank defense is being filled by the addition of 105-mm recoilless rifles to the battalion heavy weapons company.

The remodeled heavy weapons company will now have three recoilless rifle sections—two to handle four 105s, and one to handle two 75s.—*Army Times*.

Shoe-Sizing System

A new system for sizing GI shoes has been developed by the Army to cut "foot casualties" and to give the serviceman a better-fitting pair of shoes. The new sizing system may be incorporated in GI footwear within the next year.

The new system takes into account the variations in foot shapes in large and small men. The variations, not matched at present in shoe design, often result in ill-fitting shoes which make the soldier more susceptible to frostbite, blisters, and other ailments of the feet.

Although all details have not been worked out completely, shoes under the new system would come in about 8 sizes instead of the present 15. The sizes would be spaced to better advantage.

Foot measurements taken from thousands of servicemen revealed that present-day standards of shoe design needed revision. The present shoe-sizing standards, not based on actual measurements, were developed shortly after the Civil War and have not been materially changed since then.—*Science News Letter*.

Oversea Schools

The armed services operate 200 schools overseas for some 30,000 children of United States military personnel and civilian employees of the armed forces.

The Army operates 138 schools, the Air Force 52, and the Navy 10. In general, the service having the greatest number of personnel in an area operates the school for all services.—News release.

DENMARK

Home Defense Forces

Denmark has launched a campaign to increase the Danish home defense forces by 15,000 persons, thus bringing the total forces to 70,000 trained volunteers.—Danish Information Office.

Military Forces

Danish troops stationed in Germany probably will be increased this year from 1,700 men to about 5,000, according to an announcement by the Defense Ministry.—News release.

PAKISTAN

River Project

The Government has started a program to develop the rivers and waterways in east Pakistan. It intends to build a network of 4,500 miles of navigable waterways, from trunk routes and canals capable of taking large steamers to small creeks for the small country craft.

Waterways are being surveyed and marked, and a fleet of 36 dredges has been ordered to clean out dying rivers and deepen other channels to enable them to take larger craft. Moreover, tests are soon to be carried out to determine the most effective design for river craft.—News release.

THE NETHERLANDS

Air Raid Shelters

Four air raid shelters built in the center of Amsterdam by the Germans to resist allied bombs will be blown up piecemeal during the next few months.

About 4,000 holes will be drilled in the 6-foot walls and filled with small charges, which will then be fired.

The shelters are in Amsterdam's Museum Square in front of the Kijksmuseum, home of Holland's finest art treasures. Extra precautions are being taken to avoid damage to the museum.—News release.

INDIA

Fissionable Ores

Extensive deposits of gold ores, fissionable material, and other rare materials have been discovered along a 200-mile belt in South Bihar, India, according to information released recently by the Ministry of Natural Resources and Scientific Research.—*The New York Times.*

BURMA

War Damage

Thailand has agreed to help Burma rebuild several of its towns which were damaged during World War II.

Burma had asked Thailand for assistance in providing skilled labor to manufacture bricks and tiles and reconstruct ruined buildings, because there was a shortage of such labor in Burma.—News release.

CANADA

Aircraft Carrier

Canada's new 18,000-ton aircraft carrier, now being built in Belfast, Northern Ireland, will be called the *Bonaventure* (French for "Good Venture").

The *Bonaventure* will edge out the 14,000-ton *Magnificent* in 1956 as the pride of Canada's Navy.—News release.

BELGIUM

Military Program

The Government is planning a military program giving Belgium 180,000 men in the armed forces this year in addition to 30,000 men in antiaircraft defense.—News release.

EGYPT

Planes for Sale

Egypt is planning the production of planes for sale to neighboring Arab states, the Undersecretary for Aviation Affairs announced recently.—News release.

BRAZIL

Manganese Production

A Brazilian firm has agreed to deliver at least 3,850,000 tons of high-grade manganese to the United States in return for a 67½-million-dollar loan from the Export-Import Bank.—News release.

PHILIPPINES

Plane Project

A plane made of bamboo and wood—the first of its kind built entirely of Philippine material—will undergo tests soon.

The project was undertaken to determine whether aircraft bodies could be manufactured in the Philippines without imported material. The Philippines Air Force and the Institute of Science and Technology have joined in the project.—News release.

AUSTRIA

Oil Products

Soviet authorities in Vienna have announced that the Soviet Union will sell Austria more than a million tons of oil products during the current year (MILITARY REVIEW, Mar 1953, p 67).

Austrian experts said that this was about half of what the Soviets had confiscated from Austrian fields as former German assets.—News release.

TURKEY

War College

The Turkish Army plans to open a national war college this year. It will be established in Istanbul for senior officers and will be in addition to the present staff college.—News release.

SWITZERLAND

Hydroelectric Dam

Italy and Switzerland have signed a treaty to exchange 200 acres of territory in order to allow Switzerland to build a hydroelectric dam along the frontier between the two countries.—News release.

EASTERN GERMANY

Submarine Fleet

Communist Eastern Germany's Sea Police are being equipped with Soviet-made submarines to complete their light but swift coast guard service and bring it one step nearer to being a full-fledged Navy.

A flotilla of submarines is being sent from the main Soviet naval base at Kronstadt, on the Bay of Leningrad, to join the Sea Police forces.

A total of 38 former German submarine officers have been trained for a year on these vessels in the Soviet Union. In Germany, they will be stationed at the small port of Glove, on the island of Rügen, where a submarine base was built in less than 3 months of day and night shifts.

The Sea Police now have a strength of about 10,000 men and 60 vessels.—News release.

First Television Station

Eastern Germany's first television station began broadcasting recently, with a Soviet film on the German defeat at Stalingrad as the inaugural program.

The video debut provoked comments by technical men in West Berlin to the effect that television was likely to be used as a propaganda medium.

Because of the progress being made in the United States with long-range television, the technicians said that it might be possible in the near future to throw American programs onto video screens in Moscow and Leningrad.

Television broadcasts from the latter city have already been received in West Berlin under unusual conditions.

With the use of equipment now being developed in the United States, the technicians thought that transmitters in West Berlin or Western Germany could televise on the frequencies of Soviet television channels.—*The New York Times.*

GREAT BRITAIN

Marker Buoys

A new type of marker buoy, which comes to the surface when a submarine fails to surface from a dive, is being fitted in British submarines.

The buoy has a flashing light that can be seen for 2 miles. British Navy technicians are also trying to fit the buoy with a small radio transmitter to enable shipping to locate it.—News release.

Prefabricated Vessels

Parts of antisubmarine frigates and minesweepers now being built for the Royal Navy are to be fabricated.

The first prefabricated section of a frigate has already been laid down in a British shipyard. The ship is the first of a series of vessels planned for rapid construction by prefabrication methods.

Antisubmarine frigates and minesweepers form the bulk of the Royal Navy's present expansion plans.—News release.

Uranium Deposit

Geologists may have found Britain's first native source of uranium in an abandoned mine in southwest England.

The workings, near St. Austell, Cornwall, are claimed to contain uranium ore rich enough to be mined commercially. Preliminary surveys indicate there may be several million pounds of ore in the area.—News release.

Supersonic Hunter

The Hawker *Hunter*, which is claimed to be the world's fastest fighter, is now being powered by the *Sapphire* jet engine (MILITARY REVIEW, Aug 1952, p 69).

The external appearance of the *Sapphire*-powered *Hunter* is identical with that of the previous model, but because of the tremendous power of the *Sapphire*, the new machine will travel faster and farther than its predecessor.—News release.

Crescent-Wing Jet

The first cresent- or scimitar-wing, four-jet bomber—the *HP-80*—has made its maiden flight and has been taken off Great Britain's secret armaments list (MILITARY REVIEW, Feb 1953, p 69). While still on the secret list, the new bomber was put into production for the Royal Air Force.

The crescent wing permits the bomber

The *HP-80* crescent-wing bomber.

to fly at nearly the speed of sound at great heights for long distances and gives the pilot good control.

The crescent-shape wing is designed to combine the merits of the delta and swept-back wings for ultrahigh speeds. Four *Sapphire* jet engines, buried in the wing, give the *HP-80* "more power than 25 modern express locomotives."

According to the Minister of Supply, the *HP-80* will complete a series of standard jet bombers for the Royal Air Force. The others are the *Canberra*, the *Valiant*, and the *Vulcan*.—*The New York Times*.

Helicopters for Malaya

A squadron of British Navy helicopters has been sent to Malaya to take part in the war against terrorism in that country. Its main purpose will be to fly troops out of danger spots and bring back wounded. —News release.

CZECHOSLOVAKIA

Financial Reforms

Czechoslovakia's budgetary, banking, and financial system is to be reformed along the lines of the Soviet Union's practices, according to a broadcast by the Prague radio.—*The New York Times.*

NORWAY

Patrol Duties

Naval militia units, recruited from fishermen and using fishing smacks for patrol duties, have been proposed by the militia command on the west coast of Norway. Men from the small fishing villages on the mainland and islands will be trained in patrol work.—News release.

Defense Construction

The Norwegian Ministry of Defense is presently working on a series of projects estimated to cost a total of 100 million kroner. These installations are part of a 3-year defense construction program that will come to 300 million kroner.

At the present time, work is proceeding on 6 airfields, 4 bombproof mountain shelters, and 10 barracks. All told, the program calls for the construction of 2 brigade camps, 11 staff headquarters, 6 airfields, as well as bombproof command posts and housing accommodations for 3,000 officers.—Norwegian Information Service.

Power Development Program

Norway's postwar power development program has brought electricity to tens of thousands of homes, benefiting an estimated 220,000 persons, according to an announcement by the Minister of Industries. Since the liberation in 1945, the consumption of electricity has increased by 132 percent, and in the case of industry by 15 percent. About 75 percent of the prewar output went to industry. Today, industry takes 66 percent of the total production.—Norwegian Information Service.

JAPAN

Power Plan

The Japanese Government has drawn up a 5-year plan to increase annual power supply from the present figure of approximately 39 billion kilowatt hours to more than 53 billion kilowatt hours.

An economic board estimates that water power generation will be increased by 4 million kilowatts and thermal power generation by 1½ million kilowatts in 1957, final year of the plan.—News release.

Export Trade

Japan's chief competitor in export trade to Southeast Asia is Western Germany, according to the business newspaper *Nihon Keizai.*

The newspaper noted that Western Germany exported goods of an estimated value of $118,559,000 to the Southeast Asia areas during the period January-August 1952, compared with $164,667,000 from Japan during the same period.

According to Government statistics, Indonesia was Japan's best customer, importing goods valued at $47,298,000. India was Western Germany's top customer with imports totaling $36,471,000.—News release.

ITALY

National Income

The Finance Minister has announced that Italy's total national income nearly tripled during the past 4 years.—News release.

Shipbuilding Contracts

Four new contracts for the Italian shipbuilding industry totaling approximately 40 million dollars have been signed in Italy by the United States Navy.

These new contracts bring to more than 60 million dollars the orders placed by the United States in Italy for ships and harbor craft under the offshore procurement program.—News release.

WESTERN GERMANY

Automobile Production

The West German automobile industry produced more than 300,000 passenger cars last year, 13 percent more than in 1951.—News release.

Salvage Program

The United States Army is digging up the metal remains of the Nazi war machine—and transforming them into modern defense weapons.

The Army is resurrecting damaged German tanks and weapons from a grave at Dachau, Germany. Americans had buried them there after World War II to keep them from being stolen. The burial place formerly was part of the Dachau concentration camp.

Nearly 160 tons of scrap metal—valued at about $50 a ton—already has been recovered at a total cost of about $85. Army officials expect the dump to produce another 150 tons.

The Army is selling the scrap to European firms which use it in the manufacture of weapons for the North Atlantic Treaty Organization defense force and for other critical items.—*Army Times.*

American Jet Bases

The United States Air Force recently finished moving all its jet bases in Germany to positions west of the Rhine River.

This completes a major step in the building of Europe's defenses against any threat of Soviet attack.

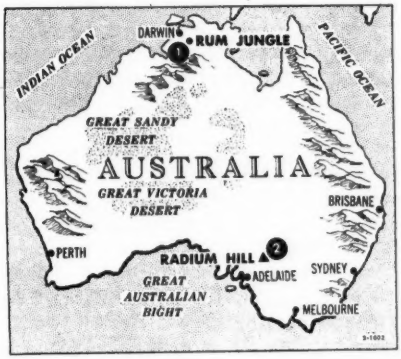
The two largest United States bases in Europe were at Fürstenfeldbruck and Neubiberg, only a few minutes jet flying time from Communist air bases in Czechoslovakia. A surprise air raid might have knocked them out or a swift Soviet drive to the Rhine would have cut them off. Now they are behind the Rhine, but still near enough to the potential fighting front to play their full military role. —News release.

AUSTRALIA

Uranium Ore Production

The United States, Great Britain, and Canada recently signed an agreement for the eventual sharing of uranium ore produced in Australia for atomic purposes.

The agreement covered the exploration, development, and production of uranium



ore in the Rum Jungle area of Australia (marked 1 on the map). An earlier agreement, signed last fall, covered exploration and development in the Radium Hill area of Australia (marked 2 on the map).—*The New York Times.*

Helicopter Field

Kingsford Smith Airport, Sydney, is being enlarged to include the first helicopter airfield in Australia. There is a prospect that helicopters will eventually be used to transport mail and passengers between the airport and the city.—*Australian Defence and Services Newsletter.*

Strategic Defenses

Australia is giving high priority to a network of air and naval bases strategically placed on islands and on the Australian mainland. This is part of a battle plan aimed principally at a potential enemy submarine threat to sea communications.—*Australian Defence and Services Newsletter.*

KOREA

Military Academy

Patterned after the United States Military Academy at West Point, New York, the South Korea Military Academy now has 400 cadets under instruction at its first anniversary. A goal of 800 cadets will be reached in 1954.

After a 4-year course, the cadets will receive a Bachelor of Science degree and will be commissioned in the ROK Army. —*Army Navy Air Force Journal.*

INDOCHINA

British Aid

The British Foreign Office has announced that large quantities of ammunition wil be sent to Indochina as part of an increase in British aid to the French forces fighting communism in that country.

The augmented British aid stems from a recent meeting of the North Atlantic Treaty Organization's Council, which expressed solidarity with France in her fight against communism in Indochina.

France asked Great Britain for artillery shells because many of the guns used in Indochina are British. The French have not requested many other British items, because the French troops are using mostly United States equipment.—*The New York Times.*

USSR

Icebreakers

The Soviet Union has placed an order for three diesel-powered icebreakers with a shipyard in Helsinki, Finland. The craft will be delivered in 1955, 1956, and 1957. —News release.

Trade Gains

Pravda reported recently that since 1948 trade within the Communist bloc has trebled, and the Soviet Union—key nation of the group—has increased by tenfold her exports of machinery and equipment to her neighbors.—News release.

COMMUNIST CHINA

Railroad Construction

The Chinese Communist Railway Ministry announced recently that 491 miles of new railroads will be built in China this year, a low figure considering China's vast size and limited railway lines. It was considered likely that the low target was set because new construction outlined for 1952 still is far from complete.—News release.

Trade Agreements

Communist China recently signed trade agreements with Bulgaria and Ceylon.

The first agreement calls for a 1-year barter pact between China and Bulgaria, increasing the 1952 trade between the two countries by 70 percent. China will receive machinery, electrical appliances, chemicals, and other unlisted products from Bulgaria in exchange for nonferrous metals, cotton, and "other imported materials."

The second agreement calls for a 5-year trade pact providing for the exchange of Ceylonese rubber for Chinese rice.—*The New York Times.*

Government-Owned Industries

The Finance and Economic Minister announced recently that the Government now owns 78 percent of all industries in Manchuria and plans to increase that control to 81.5 percent.—News release.

Land Reform Program

A high Chinese Communist official, in a summary on the land distribution program, announced recently that 300 million peasants have acquired approximately 116,670,000 acres of land. This comes to a little more than a third of an acre for each person. Many critics of the Communist land reform say it ultimately will fail, because in too many areas it merely breaks up small but sound farms into tiny, uneconomic units.—News release.

FOREIGN MILITARY DIGESTS

Air Power Difficulties in the Korean Conflict

Digested by the MILITARY REVIEW from an article by Wing Commander P. G. Wykeham-Barnes in "The Journal of the Royal United Service Institution" (Great Britain) May 1952.

THE primary purpose of this article is to discuss some of the difficulties in the air warfare in Korea. It is not our purpose to cover the things that went well, but, rather, to analyze all the things that went wrong. Therefore, we must, in the first place, put the perspective right by showing the enormous value of air power to the land campaign in Korea and the titanic efforts of the United Nations air forces in the early months of the struggle. In particular, we must in all fairness show that their effort from the beginning of the campaign was prompt, vigorous, and ruthlessly carried through.

There has never been a military service yet whose theory has matched exactly its practice in wartime. We expect to be a certain percentage wrong. Our struggle is to be as great a percentage as possible right; and so let us go into all those things that went wrong in the air campaign and never forget, throughout them, the things that went right.

Initial Handicaps

First of all is the initiative in the Communist attack. I need hardly say that the initiative is never on our side. It was not in this case. Perhaps the attack was as great a surprise as has been any campaign. Perhaps we may be inclined to turn to our intelligence officers and stare them rather hard in the eye. I would not care to criticize. Let us just say that there was surprise; and if we had not the initiative on this occasion that is nothing extraordinary, because we are not warmakers and so we never have the initiative.

Second is the theater. Korea is one of the most difficult countries in the world for tactical aviation. There are two types of country which are most unpleasant for the tactical airman: one is jungle and the other is mountain. Korea is nearly 100 percent mountainous terrain.

Third is "the politico-geographical straight jacket." I have to give it some such name as that because it is very difficult to deal with this problem in straight, plain speaking, but the implications are obvious. The airman is taught almost from his cradle that if he wishes to attack the enemy, he must attack him at his source. We have all spent years studying the art of going straight to the source of the enemy's air power in order to begin our struggle for air superiority. The

source of the enemy's air power in this campaign is out of bounds.

The fourth factor is one that we can correct. All the previous three are thrown at us as problems, and there is very little we can do about them. This fourth one we can deal with. It is the normal strategical and tactical problem of operations in any part of the world, and we can discuss it constructively, find out, if we can, what went wrong, and attempt to use those instances as arguments on which to build better conceptions. That fourth factor—the normal tactical and strategic method of operations—will be the subject of our discussions.

Deployment for Emergency

First, then, let us go back to the beginning of the campaign and look at the first and most difficult problem. We have said that we would never have the initiative. We can only prepare for the call to counter the enemy's move, when in his own good time he strikes against us.

Therefore, the initial deployment of our forces is entirely a child of circumstance. It is chance, and chance which depends very largely on what is nearest to hand, what is most suitable, and particularly upon geography and the availability of airfields. It is vital with air forces to get this initial deployment right. Perhaps it can be said, if the campaign is short and sharp, that the air commander's campaign is won or lost in the first few days. Once he has got his initial deployment wrong, only two things can save him from an inevitable defeat: good communications and aircraft with a good radius of action.

With the turn-over from conventional propeller-driven aircraft to jets, many aircraft were short of range. Communications have always been inadequate in tactical air wars—I should like stronger brains than mine to explain why. However, if the air commander cannot, for some reason, align his formations correctly in the first few days, these two things are his salvation. He can straighten out the tangle if he has first-class communications and if his aircraft have long range; but if he is short of these two things, and if, moreover, he has had the misfortune to get his units into the wrong place, he is badly placed indeed.

In this campaign, we have a land mass to which the enemy has one access through the Manchurian passes. We have access by sea from many directions, doubtless, but initially, when we were being forced back from one position to another, we were not able to put ashore the quantity of air resistance necessary to give the armies adequate support. Since we were not able to do so, our alternatives were no less than three separate land masses: the Japanese islands of Honshu and Kyushu, the Korean mainland, and the Philippine Islands. Thus, the American air commander was faced with the problem of lining up his air force against the enemy with only a fraction on the Korean mainland and by far the greater weight of his power distributed among three different islands.

The units which he produced and had to deploy in this air force were mainly the occupational, defensive squadrons of Japan. I do not wish to throw the first stone, but there can be few people who would deny that there is something peculiar about occupation, something which, if it does not actually undermine efficiency, requires added vigilance if it is not to do so.

The fighter squadrons defending Japan had not performed an exercise with the American Army between 1945 and 1950. They were suddenly thrown into this battle. It is not surprising if they were a little over their depth—they were not surprised themselves.

A war plan doubtless existed for the air defense of Korea in co-operation with the Army. I say "doubtless," because we spend the golden years of our lives in writing war plans for wars which never

materialize. We write war plans for north, south, east, and west, and doubtless a war plan was prepared here also. I am not in a position to say, but if it were it had a rough time in its implementation.

It may have relied upon the holding, by the South Korean Army, of a limited number of air bases for a certain number of days, whereas it is now a matter of history that initially the South Korean Army was broken in a very short time. Its retreat to the south left the great complex of airfields round Seoul in the hands of the enemy. I am speculating, but doubtless the war plan for the air defense of Korea was disorganized with the seizure by the enemy of those bases.

When the air force was built up—and it was built up initially in the most desperate series of counterstrokes—a tactical headquarters had eventually to be formed. The classical conception of this tactical headquarters is that the tactical air commander shall stand side by side with the general commanding the ground forces. They are there to stand or fall together. They must consult at least twice daily, and it is a physical impossibility, without telepathy, for them to be apart.

Here we had the great mass of the American air effort outside Korea. The unfortunate general commanding that effort is inside Korea, because, and quite rightly, he must be alongside the general commanding the land forces. Consequently, he has to send his orders over different communications to formations across the water, and his control must lack that personal touch so vital to an air commander. During my period there, there was a spell of about 24 hours in which communications broke down completely, and we were left to fight the war on our own. Although rather enjoyable in fact, this is certainly wrong in principle.

Communications do not seem to travel. They work well on your home training grounds or in your static organization, but if they are transported 500 miles they take vital time to work up. For many critical weeks the tactical air force worked not as one machine, but as a set of independent units. This is a very grave disadvantage.

Command

To complicate the command of the air forces, there was, first, the fact that the commanding general and his staff of the tactical air force lived inside Korea and his units lived outside. Second, the strategic bomber commander and the commander in chief of the Far East Air Forces had perforce to live in Tokyo, with the heavy striking force close to them. Although the commander in chief was close to his strategic heavy squadrons, his tactical air force was almost out of his reach.

Another point was the co-ordination of the effort of the air striking forces of the allied fleets. Perhaps the only natural feature in our favor in this theater was the fact that Korea is a peninsula, and we were able to ring it with sea power almost immediately. This was a great advantage in many ways, giving us fluidity of land operation, enabling us to go ashore when we wished and to re-embark where we wished. It enabled us also to keep carrier-borne task forces at sea. To co-ordinate the efforts of the carrier aircraft with the rest of the air campaign was a hideously complicated undertaking.

Finding the Enemy

Korea is not an easy country in which to find one's way about at the best of times. It is rather featureless—all the hills look alike and the rivers flow in every possible direction. It has no system. It is perhaps somewhat ludicrous now to think that the ancient name of this country was "The land of morning calm," when the only certain landmark in Korea is the battle line which can be pinpointed by the burning, the explosions, and the

tracer. In no other parts of the interior would I care to bet very heavily upon my position from a pinpoint.

Thus it becomes exceedingly important to have up-to-date radar and radio navigation. This relies on ground stations which must be deployed, and they do not work well immediately. At the time when I knew this theater, it was as likely as not that the navigation aids for which one was briefed would fail to materialize. A beacon which was supposed to acknowledge on such and such a frequency very often did not do so. The fixer service was equally unreliable. It is the same problem of the transplanting of a static organization suddenly into the field.

The navigational facilities that were there were much overcrowded, because the build-up of squadrons outstripped the capacity of the ground organization to handle and to serve them. It is much easier to build up in actual aircraft, which can eat up the miles to the battle area, than to build up the vital facilities necessary to operate them economically. To build up a radar warning system, a radar interception system, a radio-radar navigational system, and a series of homing beacons takes time, and during the time that they were being built up it was very difficult indeed to operate efficiently.

Perhaps this might be taken as a confession of weakness, but we must, in fact, prepare for the type of war we expect. If we prepare for, and expect, a highly scientific war, we must prepare and train very scientifically. In this particular case, in the air, as in many other things, the clock suddenly went back many years, and navigators who had been taught to rely on radar and astro-navigation suddenly had to work with nothing but a crumpled map and a stop watch, and the map none too accurate either. Can we, however, decide deliberately to put back the clock in our training mechanism because of this possibility that we may suddenly have to fight a very unscientific war?

By now both the warning system and the navigation system are up-to-date and working very well. Many of those early problems have gone, but they must be emphasized because the early part of the campaign is so much the most vital part, when everything hangs in the balance.

Striking the Enemy

Now, the aircraft are there and the organization to handle them works smoothly. In the early part of the campaign it was a matter of flinging bombs and rockets at the advancing Communists to try to save our own troops from annihilation. Later came a scientific and a systematic scheme of air co-operation. It is obvious that the Communists launched this campaign without the slightest belief that they would ever need more than token air support. Their own air force was extremely small, and even weaker than its numbers suggested. It was disposed of in less than 3 weeks. I cannot, therefore, believe that the Communists ever planned a war in which air action would play a decisive part.

Within 3 months of the outbreak they were facing a very heavy weight of aviation. I think that any soldier would agree that the air attacks which the Communists had to endure within 3 months of the opening of the conflict was equal to that thrown against any army to date.

Effective Use of Camouflage

They have had to endure that day in, day out, ever since, and very rapidly they acquired the art of camouflage, and acquired it the hard way. The man who does not camouflage well in the middle of the day may be dead by sundown; and I would say that in a considerable experience of trying to see armies from the air, I have never seen a camouflage like the camouflage of the Communist

forces. They are, to all intents and purposes, invisible. They carry their policy to such lengths that they have been known to cover the tracks of an armored fighting vehicle as it makes them. In some cases, there are photographs which show tracks that have been rather inadequately rubbed out, and on one occasion somebody caught them at it.

They have concentrated, in a country which is a mass of small villages with few towns, always in the villages, where they could put their troops under cover, their trucks in houses, and their tanks in barns, and where, in a quite small village, two or three battalions could practically disappear from sight. To get them out of these hideouts has required very extensive damage to the civilian population of Korea. It is one of the most unhappy and lamentable features of the campaign that in the effort to extract the Communists from these village strongholds, the civilian population has suffered abnormally, even worse than in the wars in the West.

Wherever their bridges are destroyed they have built underwater bridges, very hard to detect, except on photographs, and, when detected, extremely hard to destroy. In a word, they have become the masters of camouflage and deception, and I do not think any of us would be ashamed to turn to them for instruction in this art. They have, after all, learned in a harder proving ground than any of us, for anyone who has had the better part of 400 fighter-bomber sorties a day thrown against him on a narrow front is bound to learn. They have learned.

How have they survived this incessant pounding? We know something about Korean morale because we have Koreans fighting on our side. We know rather less about Chinese morale, but it must be a formidable factor if it can withstand the weight of these attacks. The effect of rockets, napalm, bombs, and cannon all going one way on this front must be devastating to any soldier, particularly when his own aviation shows no signs of fighting on his side.

To overcome the remarkable camouflage, certain steps have had to be taken which are unnatural to normal tactical warfare, and they should be considered with the greatest reserve because they are not possible under what we regard as normal circumstances. To start with, they are all based upon complete air supremacy. The changing condition of the air war may cause a modification of these tactics soon.

Air strikes in support of the army have been directed very carefully and minutely against targets in detail, both by advanced armored posts (observation posts controlled by the army), by air observation post aircraft flown by the United States Army, and by an air observer keeping a constant watch on the front, which the Americans call the "Mosquito."

The system is as follows. The aircraft take off from their base on a prearranged strike. When they come into the proximity of the battle line, they call on a prearranged frequency for a director. The director will either confirm or cancel the leader's orders. If the director cancels the order, he will put the aircraft under a "Mosquito" aircraft, which will direct the leader against the enemy in very great detail. The "Mosquito" will not merely be content to show our aircraft the area in which the enemy is to be found; he will practically show it the enemy in person. If the pilot is unable to follow his directions, the "Mosquito" is prepared to show, with tracer gunfire or something similar, the exact spot at which to direct the attack.

In addition to the pre-briefed strike, the "cab rank" system may be used under the direction of the "Mosquito" aircraft. Fighter bombers are flown into the air and are held against possible disposal on

the "cab rank" until a call from the army gives them a strike under the direction of the "Mosquito" aircraft.

Interdiction

The system of attacking the rearward elements of this invisible army had to be greatly modified. They were just as invisible in the rear of their army as they were in the battle line and, after the first few weeks, attacks on their communications by day began to show dwindling results. As they must be getting their supplies from somewhere, attacks on their communications by night were added.

However, we all know that the mortal thrust in attacks on communications comes when the battle breaks open, when the movement begins, when the breakthrough is established, and when whole divisions must be moved from one focal point to another. That is when the transport goes on the road, when the ammunition trucks, the gasoline tankers, and all the vast supporting fleet that goes behind the fighting army begins to move. So long as the battle creeps around yard by yard, attack on communications is not a decisive factor and can only weaken the enemy, and not mortally wound him.

However, by attacking by night it was possible to cut down the fighting efficiency of the Communist front line, and to ensure that every man, every weapon, every shell, every sack of rice, and every can of gasoline had to be smuggled into the enemy front line. I have already said that the Communists are first-class camouflage artists. I am bound to admit that they are also first-class smugglers. The stuff still gets there, and until the conflict can be stirred into a war of movement I do not believe that the interdiction can ever be decisive.

I do not think that the evaluation of the weapons used in this conflict should occupy us very long. There has been nothing revolutionary and, perhaps with the exception of the napalm incendiary bomb, there is nothing of which the capabilities were not a known factor. The napalm bomb proved itself to be extremely valuable in many aspects of hill fighting and in many uses, both against armor and against strong points. We must not be too precipitate in our claim for this weapon, but we should at least give it a fair trial, and that, I think, we are now doing. At the beginning of the campaign, it was distrusted by many people.

A false lesson that came out of Korea was a denigration of the jet aircraft as a support weapon for the army. The argument went as follows: "The jet flies fast, the jet has short endurance. We want to see what is going on on the ground and to attack it. The jet cannot do these things. It goes by too quickly, and it goes home too soon." That argument was built on a number of somewhat ill-digested lessons. However, with a few adjustments in the design of the jet which may be used for ground attack, it will be found to be more suitable and have a higher hitting capacity and a higher sustained offensive capacity than its equal weight, pound for pound, of propeller-driven fighter bomber.

Strategic Bombing

The initial strategic target was the industrial area situated between Hamhung and Wonsan. With a certain amount of initial inaccuracy, the heavy bombers corrected their aim and eliminated it very quickly. In fact, it is fair to say that the strategic bombing ceased after about 2 months of the conflict; but perhaps we must get a new idea of strategic bombing. Certainly, the war potential in Korea, or that part of the war area which was not out of bounds, was successfully eliminated in a very short time.

Then began the isolation of the enemy army by bridge-busting, and that is still

going on. The type of bridge which is built in Korea, which is a land of bridges, is extraordinarily hard to hit from the air, but I think it is safe to say that every bridge of tactical importance to the enemy has by now been destroyed.

Unhappily, the Communists have mobilized a huge army of laborers. With this almost inexhaustible supply of coolie labor, they are prepared to rebuild bridges in wood, or under the water in the form of stone ramps and embankments, almost as fast as they can be destroyed. A very elaborate bridge recently destroyed for, I think, the second or third time was rebuilt completely in wood within 48 hours and had to be destroyed again. The work of the strategic bombers for many months past has been destroying semi-tactical targets which are built up again almost as fast as they are hit.

At first, the bombers went unescorted, but to continue their policy they are needing every day a heavier weight of fighter defense.

Support of the Air Forces

The supply and maintenance problems of this campaign were headaches from the outset. Only Pusan was a port of any use whatsoever as a supply base. It had an extremely limited handling capacity and never really gave the air force the backing it required. There are now, of course, additional port facilities, but I think they will never be completely adequate.

The battle, therefore, particularly at its most critical phases, has been most intensely affected by the United Nations capacity to bring air transport aircraft into the theater. Again and again air transport has been called upon to supply for an emergency in very large tonnages. Nobody who observes this campaign can fail to be impressed by the extent to which air transport has been called in at crucial moments and the magnificent service which the American air transport organization has given.

The essential lessons for us with air transport are, first—and we do not need to be told this—that it is vitally important; and, second, that when forming it we need two types: long range and high speed, in small quantities; short range and slow speed, in large quantities. Those with short range and slow speed must have certain qualities. First, this type of aircraft must take off and land in the smallest possible space. Second, the speed is unimportant—anything over 100 miles an hour will do. Third, it must be reliable, with the reliability not of a Ford car but of a horse and cart. If it is not reliable, the situations into which it is thrown will merely deliver it into the hands of the enemy. The United States Air Force was operating transports continually from air strips that were practically within artillery fire of the Communist lines. If they are operating when we are retreating, an airplane need only be unserviceable for 2 hours and it is delivered into the enemy's hands. Short landing and reliability for our air transport are necessary before all else.

To complement that most important characteristic, we must be experts in the art of building air strips. Naturally, the smaller the distance required by our transport aircraft for landing and takeoff, the smaller we need to build our air strips. The problem of air supply in Korea became almost entirely a problem of building strips. Korea has very little land and most of that is marshy. Every air strip was a major engineering effort. We must invent an air strip that needs less manhours to build it. It is, perhaps, as important a problem for our engineers to face as is the problem of building the highest performance fighter.

Finally comes the problem of fighting the *MiG-15*. This, which has developed in the last few months into the major factor

in the air war in Korea, is perhaps the most interesting problem to the professional airman. Why did the *MiG* come into the conflict at all? The *MiG-15* is a most up-to-date fighter. It is right in the very forefront of the world's technical designs. It is still at the stage where it would be excusable to nurse it on the smooth cement runways of its homeland. Starting with a small and ineffective air force, the Communists are now deploying ever increasing quantities of a delicate and expensive machine, toward an end which is still a mystery.

I cannot see any reason for the first 9 months of its operation but that of tactical trials. It first appeared on 17 December 1950, and it has been slowly extending its influence, very cautiously, mile by mile, and, increasing the size of its patrols, aircraft by aircraft, it has been spreading south.

At first, it was flown cautiously and inexpertly. It has since been flown very much better. At first it avoided combat; now it is tending to seek combat. Everything that we see about the behavior of this airplane shows us that Korea has been used as a testing ground for it. By a combination of light airframe, high engine thrust, and good aerodynamic design—I was tempted to say "fortunate" aerodynamic design, but it is a wrong principle to attribute good luck to one's opponents—a first-class airplane has been produced. Let us make no mistake about it.

We thought that it had two or three weak spots. We are beginning to doubt whether it has these. It is flown by pilots who speak Chinese on the radio. I cannot say that that proves anything in particular, because one needs no more than about 200 words to operate aircraft on the radio, and even when these words are Chinese they can be learned.

Most important of all, its bases are north of the Yalu River. Consider the predicament of the air commander of the United Nations air fighters in Korea. He sends his aircraft from about the 38th Parallel and flies them 150 miles north toward the border to maintain the air superiority necessary for our armies to operate unmolested from the air, and also, of course, for our bomber offensive to continue unchecked. They arrive with a great deal of their fuel used up. When they arrive, they provide protection for the friendly bombers or protect the area in which the bombers may be expected. They attempt to supply "area superiority."

At the time which suits them, when the sun is in the right position, when their morale is at its highest, and when their formation is perfect, from across the Yalu River in the north come 50, 60, or 100 *MiG-15s*. We cannot even photograph them on their bases. We cannot molest them on their airfields, nor attack them while they take off nor surprise them while they are forming up. We wait, as we must, until they have reached the height of 40,000 or so feet, until their formation satisfies their leaders and they have the sun behind them, and until we are ourselves rather short of fuel. They then come; then the fight begins.

That is the problem in front of the fighter commander in Korea. How long he can continue to give an assurance to his commanding general of a reasonable degree of air superiority under those conditions, it is not for me to say, but with so many factors against him it must be exceedingly difficult for him to cope with, even now.

The accounts of fighting this *MiG-15* show that under any circumstances it would be an opponent to be respected. It has an excellent performance. It has a very powerful and hard-hitting armament, although in some respects we think that this is not entirely suitable for jet-to-jet fighter engagement. This may partly ac-

count for the fact that the engagements between jet fighters have not produced very heavy casualties as yet on either side, coupled with the fact that up to now the *MiGs* have not pursued a particular air policy. They just interfere. We think that now they are bidding for air superiority over the heads of their own armies, and we may expect to see more decisive results when the fighters engage and stay until a decision is reached.

Conclusion

Let me summarize. Some of the worst problems were at the outset. First, there was some unsuitability of equipment and training. That, we feel, is inevitable. No military force has ever gone into the field with completely suitable equipment and training. Had it done so, it would have been too good for this world. Next, there were the problems of shortage of airfields, shortage of means to make airfields, and shortage of communications and inadequacy in their working when they are transplanted; navigational facilities which are not sufficiently portable; and being thrown back upon elementary navigational principles which have fallen out of use, perhaps because we have advanced too far along purely scientific lines; and deployment of forces in the field because of necessity, and the awkwardness and the handicap of using those forces subsequently after they have once been deployed. Remember how difficult it is for an air commander, once all his units are deployed and the supporting lines built up to keep those units working, to change everything around.

Of the problems which still persist, the greatest difficulties of all are, first, fighting an enemy whose base is just off-stage; second, attacking an army that has brought camouflage to the highest pitch of perfection we have seen yet; third, the natural disadvantages of that unhappy country; and fourth—something which is completely fundamental, but who can resist mentioning it?—the lack of the initiative. The enemy still has a positive aim; we are merely trying to frustrate it.

All of us spend our working lives planning to face first this threat, then that, and then another, none of our own making. We have always to plan for someone else's war, and we always will have to plan for someone else's war—a multiplicity of plans, a piling up of one imponderable upon another. How happy for a while is the aggressor, who designs his own war and then duly begins it in his own time. He may face an international court of justice in the end, but I cannot help a twinge of envy for him as he puts down on paper all the things he has learned throughout his professional life and, for at least the first few months, sees them all go smoothly into action.

For us, instead, an infinite combination of possibilities; consideration of every part of the world as a possible scene for our next containing action, an endless diversity of uses for our machines of war. The unhappy designer says to us, "This equipment will never be meant to do so and so." It may not be meant to do it, but doubtless it will have to do it; and, always, in the course of our training and in the course of our planning, we must prepare it for anything that may come, so that we may turn to face whatever may be sent against us.

The Most Vital Prelude to Victory

Digested by the MILITARY REVIEW from an article by Colonel Qurban Ali Khan in the "Military Digest" (Pakistan) August 1952.

IN THE past it was considered that the main objective in war was to destroy the enemy forces in the field. Total war, however, has led to attacks on all forms of enemy activity with a view to destroying the enemy nation's will to fight. It is the purpose of this article to consider whether the destruction of the enemy forces in the field is still the most vital prelude to victory.

National Aim in War

The ultimate national aim in war is to make the enemy capitulate. To achieve this aim, it is necessary to break the will of the enemy nation, so that the people cannot continue the struggle.

Wars of the Past

In wars of the past, the armed forces fought each other to protect their respective nations against aggression. So long as these forces opposed each other and held their positions in the field, neither force could do any damage to the other nation. During such wars, no nation ever gained a decisive victory without destroying its opponent's forces in the field.

Recent Experiences of War

Modern weapons of war have made it possible to bypass the enemy in the field and strike at his national bases. If a nation can be mortally wounded by a blow at its heart, its army, navy, and air force will cease to function. The destruction of an enemy nation's forces is one of the means of bringing the struggle to a successful conclusion and breaking the will of the opposing nation. The other means are disorganization and demoralization of the nation itself. This can be achieved by total war.

Total War

Total war includes, among other things:

1. Disrupting the enemy's vital lines of supply and commerce by sea, land, and air, with the resultant weakening of his strength and economy, which makes him incapable of a sustained war.

2. Striking at the enemy's economic system, and damaging his war production so that output is inadequate to meet the needs of his forces in the field.

3. Carrying out such activities as will, by causing suffering, loss, shortages, and inconvenience, tire and sicken the enemy nation and thereby spread a sense of hopelessness among the people.

4. Breaking the morale of the people by subversive activities. Although the airplane, atom bomb, and rocket offer new and almost unlimited scope for striking at the will of an enemy nation, it is impossible to gain victory without first disorganizing and demoralizing the opposing nation. The enemy forces may be defeated in battle, but the struggle will continue until the will of the enemy nation is overcome.

The defeat of Germany in World Wars I and II and other experiences of the last war have shown the various ways in which a nation's will may be destroyed. In the following paragraphs, a few examples from the recent wars will be discussed.

The fall of France and the defeat of the British Expeditionary Force in Western Europe, in June 1940, brought about the worst possible crisis for Great Britain. Her harbors and industrial cities were subjected to heavy air attacks; Germany's long-range aircraft were able to search for and bomb her shipping at long distances; and German U-boats were directed on to Britain's hard-pressed convoys in

order to cut her sea lines of communication in an attempt to strangle her war effort. In spite of all this, British civilian morale was undaunted, and spirits remainded high. The British people resolved to fight on and to produce bombers in such large numbers as would enable them ultimately to surpass the Germans in aircraft production.

In World War I, Germany collapsed internally owing chiefly to the allied sea blockade which succeeded in cutting off the country from the rest of the world. This induced war weariness in the people, shattered their confidence in their leaders, and caused an internal revolution. Therefore, although the German forces in the field were intact, the nation's will to fight was destroyed. This led to Germany's ultimate defeat.

At the end of 1940, the British decided that bombing should constitute the main offensive against Germany. The targets selected had a close bearing upon the enemy war machine. Before the second front was opened in 1944, Germany's resources to continue the war had already been destroyed to a great extent. Precisely at this stage, the allied armies were launched into the second front for the final kill. However, had it not been for the allies' destruction of the enemy's war machine and his lines of communication, the enemy would have confronted the thrust with much greater vigor than he was eventually able to summon, and much more equipment and heavy arms than he was able to put into the field. It is probable that the allies might not have been able to bring about the final showdown for a much longer time. It has generally been accepted that the allied path to victory was paved by bombardment, and that the destruction of Germany's war resources hastened her defeat.

Before World War II, Hitler said, "I shall maneuver France right out of her Maginot Line without losing a single soldier." This came true for his losses were small in comparison with his gains. The German fifth column had firmly entrenched itself in France; its agents were able to influence the counsels of the highest and spread panic and defeatism among the Government and the military high command. There has never been so rapid a defeat of a great nation as that of France. The French Army of nearly 5 million men collapsed, and the country supinely accepted the conqueror. All this happened in 4 weeks.

At the time of the Japanese surrender in World War II, a very considerable part of the Japanese Army was still intact. The garrison of the home islands, apart from the home guard, was calculated to be about 2 million men. The Japanese collapse was due to the cumulative effect of many factors which destroyed the country's will to fight, mainly the destruction of the large built-up areas in the Japanese towns and the damage inflicted upon Japan's war economy. It was the atom bombs on Hiroshima and Nagasaki, however, that completely undermined the morale of the Japanese people and finally caused them to surrender.

Conclusion

The most vital prelude to victory is the disorganization of the enemy nation itself by such means as will destroy that nation's will to fight. The destruction of the enemy forces in the field is one of the means employed to bring the struggle to a successful conclusion.

In the past, the main objective in war was the destruction of the enemy forces in the field, but with the advent of modern weapons of war this objective has become only a secondary means of winning a war.

Sea Power and Air Power

Digested by the MILITARY REVIEW from an article by Air Marshal Sir Robert Saundby in "The Royal Air Force Quarterly" (Great Britain) October 1952.

SOME 50 years ago, before the invention of aircraft, the Royal Navy had been for more than three centuries our first line of defense. Our island situation enabled us to rely on our sea power, and absolved us from the necessity, forced on all other Western European countries, of maintaining large standing armies in time of peace. During the long and mainly peaceful reign of Queen Victoria, our Army, in strong contrast with the Navy, was at a low ebb. In 1853, when we were anxious about the behavior of Russia, the Government decided that a full-dress review of the British Army might help to keep the peace. Some 10,000 men were assembled in camp at Chobham, and that was about all we could raise in this country at that time.

We have never needed large armies for home defense. We raise them only in time of war, for service overseas, and we disband them when the war is over.

For more than three centuries the people of this country regarded the Navy as a guarantee that no foreign invader should set foot on our soil. As Lord Anson, First Lord of the Admiralty in the latter part of the eighteenth century, put it: "I do not say that they will not come. I only say they will not come by water." And as long as the only way to reach us was by water, the Royal Navy maintained effective control of the narrow seas that separate us from the European Continent.

In addition, before the rise of air power, our fleets could ensure the safe convoy of our armies overseas, protect our sea communications, and cut off those of our enemies. Blockade at sea was then a powerful weapon, and its exercise alone might enable us to deal successfully with nations largely dependent on sea communications.

Three centuries is a long time, and habits of mind which have continued for so long are difficult to remove. In the mental make-up of our people, there is a deeply implanted feeling of trust in, and admiration for, the Royal Navy. Even to this day our troops and airmen, when they are in a difficult situation and things are going wrong, murmur half in fun and half in earnest: "Thank God we've got a Navy." This attitude of mind, in itself, is natural and harmless, although there is a danger that the Navy will, perhaps subconsciously, be expected to carry out its former functions—to protect us from invasion, guard our sea communications, and exert pressure by blockade on our enemies. There is a danger of failure to realize that, in these days of air power, the Navy can no longer do any of these things.

It is the purpose of this article to attempt to give some indication of the present-day capabilities and proper responsibilities of the Navy, and to note the way in which these may be co-related with the growing responsibilities of air power.

Control of the Seas

The Navy can no longer control the seas around our coasts. In fact, the Navy can venture into the North Sea and English Channel in wartime only if it is assured of the protectioin of superior air power. The Navy can no longer, by itself, protect our sea communications or cut those of the enemy. This can be done only by sea power and air power acting in concert. Finally, the Navy has nowadays almost no strategic offensive power.

It is sometimes claimed that large, fast aircraft carriers will be of great value in bringing bombers within range of

vital targets. This aspect of the carrier emerged, as De Seversky says in his latest book, *Air Power: Key to Survival,* as a temporary substitute for aircraft range. He goes on to say: "In the last war, aircraft carriers as a genuine fighting element were barred from the Mediterranean, the North Sea, and every other point defended by the German *Luftwaffe.* They did not venture into Japan's home waters until the fourth war year, when we had won nearly complete mastery of the Japanese skies. The spectacular fighting record of our carriers has obscured the most crucial military fact: that in the last war carriers *never* challenged a continent genuinely defended by air forces. Nothing has happened since then to justify the belief that carriers will be able to do in the future what they could not do in the recent past. On the contrary, the greatly expanded range and striking power of defending land based aviation has made the floating base that much more vulnerable. . . ."

This is undoubtedly true and, in any event, the "greatly expanded range" of bombers has made such suicidal attempts unnecessary.

The Navy Role Today

What, then, is the role of the Navy today? In the debate in the House of Commons on the Air Estimates in March 1952, a former naval officer, moving an amendment urging an impartial inquiry into the working of the Coastal Command, said that "antisubmarine warfare is, today, almost the Admiralty's sole remaining task." He went on to confuse antisubmarine warfare with the protection of our sea communications and sea-borne trade, and argued that the Admiralty should have under its direct control all the forces, including air forces, which are needed for the discharge of that responsibilty.

The protection of convoys and the hunting of submarines at sea, whether by means of aircraft, surface vessels, or submarines, is only a part, albeit a very important part, of the safeguarding of our sea routes and sea-borne supplies. The danger from air attack on our shipping, from airborne mines laid in our harbors and the approaches thereto, and from the destruction of our docks and their communications by bombing, might well be more serious than the threat from the submarine. Apart from minesweeping, the Navy can do little or nothing to protect us from these dangers. However, they may easily become so menacing as to require the diversion of a large part, or even all, of our home based air power to bring them under control. It is easy to imagine a situation in which almost the entire effort of the Bomber and Fighter Commands would have to be, for a time at least, devoted to the task of averting these perils.

This fact alone shows the absurdity of the idea that the Admiralty should assume the full responsibility for the protection of our sea-borne supplies, and take possession of all the forces required for this purpose.

In considering the role of the Navy under modern conditions, it must be remembered that, apart from Britain, only the United States Navy has any considerable strength in surface vessels, while the Communist bloc, no doubt, possesses a substantial number of submarines and aircraft.

The Future Task

It would seem to me, therefore, that the definition suggested in the debate, to which I have referred, is not very wide of the mark, and that the Admiralty's task, in the future, should be the local protection, at sea, of military and mercantile convoys and such part of the hunting of enemy surface vessels and submarines, at sea, as may be performed by warships or ship-borne aircraft.

If this is accepted, then the present

organization, whereby the Admiralty is responsible for ship-borne aircraft and the Air Ministry for all other aspects of air power, seems to be sound and practicable. And it follows from this definition that the design and equipment of warships, carriers and ship-borne aircraft should be conditioned for this task.

The Parliamentary Secretary to the Ministry of Defence, replying to the debate on the Air Estimates, gave some information about an agreement made between the Admiralty and the Air Ministry in 1946. As few people, I suppose, have the opportunity of reading *Hansard* and as these points have not, as far as I know, received much publicity, they are perhaps worth setting out here.

They are as follows:

1. Where the Royal Navy and the Royal Air Force are working in co-operation, the problem is a joint one, but as such operations are the primary concern of the Royal Navy, the naval command in all normal circumstances is the predominant partner.

2. Other units of the Royal Air Force up to the total strength available may be required to undertake tasks connected with the war at sea, such as the fighter escort of convoys, sea mining, and tactical or strategical bombing.

3. The proportion of the total existing and potential strength of the Royal Air Force which shall be specifically equipped, allocated, and trained to meet world-wide maritime commitments will be laid down from time to time by the Government, acting on the advice of the Admiralty and the Air Ministry.

To sum up, the coming of air power has greatly curtailed the responsibilities of the Royal Navy. It is no longer our first line of defense and indeed its role, although vitally important, is now secondary and almost completely defensive in the strategic sense.

In the protection of our sea communications and our sea-borne trade, both the Navy and the Air Force have a great part to play. With regard to the Navy, this task will normally absorb the whole of its resources. Moreover, as we have seen, there may be times when a very large part of the effort of the Air Force will have to be diverted to this defensive role. A diversion on this scale would, however, have very serious consequences on the conduct of any war in which we might be engaged and, if unduly prolonged, would be bound to prejudice our chances of victory.

The growth of air power to the point at which it dominates warfare on land and at sea has made obsolete most of the "classical doctrines" which grew up during centuries of two-dimensional warfare. These doctrines, so long accepted as axiomatic, are no longer valid, and it is necessary to go back to the unchanging principles to formulate new ones.

Moreover, underlying any such reconsideration of the doctrines of war must be the realization of the unity of the air. It is true that the sea is one, but the air ocean transcends the oceans of the sea; it lies over the entire world and knows no shores or barriers. Moreover, in war, the air situation must always be considered as a whole and not by areas or zones, or in terms of sea warfare or land warfare. The entire essence of air power is its ability to concentrate its full effort, when required, at the decisive point. Therefore, the control of air power must be centralized, and it would invite disaster to divide it into separate packets.

The unity of the air ocean dictates the unity of the air power that seeks to control it.

Tanks and Antitank Defense

Translated and digested by the MILITARY REVIEW from an article by Kurt Gilbert in "Revue de Defense Nationale" (France) April 1952.

IT IS not the purpose of this article to advocate a particular type of employment for tanks or antitank defense, but, rather, to discuss the respective values of the tank and antitank defense, based on the author's combat experience with the German Army in World War II.

The Tank

The tank possesses three fundamental characteristics: mobility, fire power, and armor protection. It is in accordance with these characteristics that the tank is engaged on the battlefield. At times, one of these three will dominate, at times another, depending upon the situation. It is the duty of the commander and the individual tank crews to make the decisions in regard to these characteristics, for they give the tank its value in combat.

Antitank Defense

Antitank defense aims, above all, at penetrating the armor of the tank in order to put it or its crew, or both, out of action. At first glance, this might sound like a simple task, especially if the number of antitank weapons bears any relationship to the number of tanks. However, we know that the North Koreans obtained their alarming successes during the initial stages of the Korean conflict with only four battalions of tanks, which enabled them to bring the opposing forces almost to the brink of destruction. Let it be noted also that Korea does not possess terrain that is favorable for the operation of tanks; on the contrary, the terrain lends itself particularly well to a defense against the tank. Moreover, the tanks employed by the North Koreans were not ultramodern, but, rather, *T34s*, with an improved turret and 85-mm gun.

What has been said so far is not intended to place major emphasis on the tank, for it goes without saying that the antitank guns are capable of putting a tank out of action. There is, however, quite a discrepancy between theory and practice. There is much that can be said for both sides—that is, the tank and antitank defense—they both have their advantages and their disadvantages.

Penetrating Power

During the Polish campaign, my tank was hit six times by projectiles which pierced the armor, but it was only the seventh that set fire to it, putting it out of action. Although the tank was knocked out of action, not a man of the crew was wounded.

During the course of the Kurland fighting, which lasted 10 days, we counted, every evening, the number of hits received by our tanks. Every tank had been hit at least two to four times. In totaling them all up, it was reassuring to find that the percentage of hits actually attaining their aim of putting the tank out of action was relatively small.

Attempts were made during the last war to improve the penetrating power of the various antitank weapons, but these changes were generally met with improvements in tanks, such as thicker armor and better slope of the outer surfaces to deflect projectiles. Thus, tanks became heavier and slower, and antitank weapons became bulkier and harder to conceal.

Psychological Factor

There is another factor that must also be considered in a discussion of the tank and antitank defense—this one is psychological. There is a great deal of dif-

ference between a weapon which is protected by an armored shield, and able to maneuver with calmness and assurance, and a weapon which is unprotected and threatened from every side. Everyone who has witnessed a tank charge into enemy lines has seen this psychological factor produce greater results than the employment of its weapons.

Air Attack

There were many examples of aircraft attacking tanks during the last war, but it is impossible to state that individual attacks by planes were always crowned with success—either in the East or the West. In the initial phase of the Normandy landings, allied bombers, operating in groups, were able to achieve certain results against tanks which were not engaged, but fighter planes did not register particular success. Who does not remember the diving attacks that Soviet fighters made against our isolated tanks, sometimes lasting for hours, but which ended with no success? Liddell Hart has also stated that the action of United Nations planes against tanks in Korea has not justified the hopes founded on this action. The tank has chances, therefore, in the face of aircraft. The effort must be made to maintain these chances, even of increasing them.

Tank Construction

As has been stated before, three elements must be considered in the tank—its mobility, its fire power, and its armor protection. It is the harmonious balance of these elements that makes the tank a weapon of great value. However, since these elements work against one another, one is always forced into a compromise. An increase in the strength of the armor protection results in an increase of weight, which holds back speed or leads to fitting the tank with heavy appendages.

Armor protection is certainly an important consideration, and one is inclined to develop it as much as possible, as was done in the case of the German *Tiger* tanks. However, it must not be forgotten that the most common Soviet tank is a medium tank, which has played, and still continues to play, its role perfectly—as witnessed in Korea.

Everything considered, a medium tank incorporating the following features could play a decisive role on the battlefield: weight not exceeding 45 tons; armor plates placed at the optimum angle to deflect projectiles; top protection against air attacks; a speed of up to 25 miles an hour, even in loose soil; a powerful engine, diesel if possible; a radius of action of 125 miles; a 75-mm or 88-mm gun of very high muzzle velocity; a machine gun firing forward; an antiaircraft machine gun capable of being maneuvered from the turret; steel bogie wheels faced with rubber; and broad caterpillar treads.

Number and Organization

A certain school of thought sees the tank as an instrument to support the infantry in attack and defense. Another sees it as a strategic weapon which, in the form of divisions or corps, fulfills in an offensive manner even defensive missions. Only this latter concept corresponds with the real nature of the tank; all the others rob it of its principal element: mobility.

The manner in which an army organizes its tanks is the clearest index of its intentions. On the other hand, the absence or the presence of tanks determines its possibilities. The conclusion that one can draw from the German experiences on the various fronts is that the success and possibilities of tanks diminish with their number (see the diagram on page 89), and that increases in caliber should never be obtained at the expense of numbers.

The construction and maintenance costs of the armored formations, and the limits

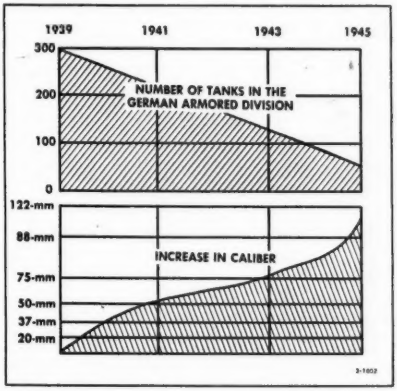
which are imposed on the same, will stand in the way, doubtless, in the future, of the possession of two types of tanks: one type to support the infantry and another type for the strategic armored divisions. It will be necessary, therefore, to decide on one or the other. If one chooses the first solution, we have the experience of World War II to show us where that will lead. Although the number and the quality of the tanks employed in 1944 were greatly superior to what they were in 1940, it was no longer possible to achieve decisive concentrations; the tanks were distributed like "corset stays" over the entire length of the front, utilized in part as fixed strong points, and shorn of their most valuable characteristic—movement.

Resistance in Combat

Tanks are much less vulnerable than is commonly admitted. Their resistance in combat in the face of special weapons is astonishing, even unbelievable. The most recent experiences from Korea confirm this fact. When one hears it said that the era of great armored operations has passed, it suffices to recall the victorious action of the Soviet tank units in Germany during the final phases of World War II. However, as is the case with all weapons, certain conditions have to be fulfilled. In addition to the purely technical problems, one has also to solve those of organization. The organization that most nearly emulates the tank's major characteristic—movement—is the armored division. The armored division should have at its disposal a sufficient number of tanks to give it the ability to attack with all the power and to whatever depth that is necessary. The minimum should be 300 tanks.

The armored division finds its complement in armored infantry, artillery, engineer, signal, and reconnaissance units. All of these should be capable of following the tanks on the field of battle. All should, therefore, be equipped with light armored vehicles capable of cross-country movement.

It will be necessary, in the future, to give particular attention to protection against air attacks. All the units of the armored divisions must be provided with



weapons of great fire power for this purpose. These weapons must likewise possess sufficient protection to enable their crews to serve them with the calm and assurance necessary in the face of attacks by fighter planes and fighter bombers.

Another factor, and this one is of primary importance, is the selection and training of the men who will operate these costly weapons. They must possess the ability to make prompt decisions, they must be mentally supple, and they must possess great perseverance. Appropriate training must make them capable of rapid independent action, and of perceiving instantly the smallest chances offered by a local success. It is they who create the conditions which enable the command to act decisively.

Flight Refueling--The Position Today

Digested by the MILITARY REVIEW from an article by Air Marshal Sir Robert Saundby in "The Aeroplane" (Great Britain) 28 November 1952.

NOTHING more drastically limits the operations of aircraft, whether they be bombers, fighters, long-range reconnaissance, or military or civil transports, than the fact that they can lift into the air only a limited supply of fuel. In fact, the design of almost every type of airplane resolves itself largely into a matter of juggling with the conflicting claims of range or endurance on the one hand, and speed and payload on the other.

Influence on Operations

There are many ways in which this question of fuel supply fundamentally affects the operations of military and civil aircraft. Taking the bomber first, it has long been the practice to provide both a large fuel capacity and a large bomb-carrying capacity. No bomber today could take off with a full bombload if its fuel tanks were also full. This provision allows a good deal of flexibility in operation. It makes it possible to carry a full bombload with a short radius of action, or a smaller bombload with a larger radius of action; the limiting factor being maximum permissible take-off weight.

The fighter, which demands a very high performance with a powerful armament, must be content with a relatively small fuel capacity. It is, therefore, usual for defensive fighters to have an endurance of little more than an hour or so, while long-range escort or tactical-force fighters can increase their endurance only at the expense of load or performance. This greatly limits their operational usefulness. Defensive fighters may be sent into the air on a false alarm or as the result of an enemy feint, to be caught with full ammunition supplies but short of fuel when the main attack comes in. We used such feints with a high degree of success in planning the operations of the Bomber Command during the past war. Long-range and tactical-force fighters are also seriously handicapped by the ever present danger of running short of fuel.

Long-distance reconnaissance and anti-submarine patrols demand a large fuel capacity and, consequently, very heavy and expensive aircraft are necessary to meet this requirement.

Transport operators, both military and civil, are always faced by the problem of trying to work out the best compromise between range and payload. In the case of military transports, it may not always be possible, for geographical or political reasons, to use short stages, and the payload may, therefore, have to be drastically reduced. As this form of transport is most valuable in an emergency, when the rapid movement of troops or material is an urgent matter, such a reduction may well be serious or even locally disastrous.

With regard to civil air transports, it is sometimes, but not always, possible to organize a route in reasonably short stages which permit a high payload. However, for ocean or desert crossings, or flights crossing the polar regions, long stages may be unavoidable, and a reduction of payload must be accepted. This may, in some circumstances, make it very difficult, if not impossible, for the service to be run except at a loss.

Jet Propulsion

The introduction of jet propulsion has made the problem more acute, owing to the very high fuel consumption of jet engines. By flying fast at great heights, jet bombers and transports can reach a fairly good figure in miles per gallon, although

not as good as that achieved by piston-engine aircraft. However, if jet aircraft are kept waiting on the ground before take-off, or "stacked up" on return awaiting permission to land, very large amounts of fuel will be used up, which will sharply curtail the range or endurance.

Once an aircraft is airborne, however, it can carry a load considerably in excess of its maximum take-off weight. Conversely, if an aircraft can be loaded in the air after take-off, smaller wings leading to higher speeds with a given power plant can be accepted. Realization of these facts prompted experiments in refueling in the air from a tanker aircraft. These began some twenty or more years ago, but at that time the technique was clumsy and very slow. A hose towed by the tanker was picked up by a grapnel streamed from the receiving aircraft, and the hose hauled in and coupled to the tank. Flow was by gravity only, and the operation took a long time to complete. A high standard of training on the part of the aircrews was necessary, and the process could be carried out only in clear air in daylight.

I remember that the Air Staff more than once made a study of the advantages and disadvantages of adopting this system. It was clear that it would be quite feasible, in favorable circumstances, to refuel one or two individual bombers or fighters from a tanker, and that this would enable them to undertake special missions. However, we were at that time visualizing air operations involving massed attacks by hundreds and even thousands of bombers, and a defensive organization employing many squadrons of fighters in the air at the same time. In such conditions, even if the provision of a large number of tankers were accepted, it would have been quite impracticable to have made any general or even considerable use of the existing system of refueling in flight. Therefore, I think that, before and during the past war, the Air Staff was right in its decision not to adopt the system in the Royal Air Force.

Position Has Changed

However, since those days, two new factors have arisen which have radically changed the whole position. The first, and perhaps the most important, is the vastly improved technique that has been evolved. The main points in this are the "probe and drogue" method of coupling the tanker and the receiving aircraft, and the introduction of high-speed pressure refueling. The system is now simple to operate and provides for a very rapid rate of refueling. It can be carried out by aircrews after a small amount of practice, and can be operated successfully in the dark. The problems attending high-speed pressure refueling have been largely solved, and it is now possible to refuel at the rate of up to 500 gallons a minute, at speeds of up to 250 knots, and at altitudes up to 25,000 feet. In addition, one tanker can refuel simultaneously three small aircraft, such as fighters.

This is a tremendous advance on previous methods and entirely alters the picture. It makes it feasible to refuel a fighter squadron in the air in a short time, and so enable it almost to double its striking range or endurance. This would be of great value, not only to defensive fighters, but to those employed with tactical air forces, since it is often difficult to find bases suitable for modern jet fighters within easy range of battle zones. This difficulty has been in evidence in Korea.

However, even these advances in technique would not make it practicable to increase, by means of flight refueling, the range of a massed raid of several hundred bombers. However, in my view, we are much less likely in the future to employ long-range bombers in massed at-

tacks. There were two main reasons for these tactical concentrations in the past war. The first was the relatively small destructive power of bombers carrying conventional loads of high explosive and incendiary bombs. This was accentuated because, owing to the need for operating at long ranges, the bombers were often carrying reduced bombloads. Second, such concentrations had the effect of saturating and overwhelming the defenses, both active and passive.

Future Air Operations

In the future, we must expect that the main business of mass destruction at long range will be entrusted to the high-speed jet bomber carrying atomic weapons. However, although one aircraft might be capable of doing the job, it is unlikely, for tactical reasons, that only one would be employed. It is more likely that 10 or 12 or even more bombers would be sent, with 1 or possibly 2 of them carrying an atom bomb and the remainder more conventional weapons. In this way the enemy would not know which aircraft were carrying the atom bombs.

There would be no point in such bombers flying in formation or even in company; it would probably be better to dispatch them singly at very short intervals of time. Such an operation would readily lend itself to the modern technique of refueling in flight. By this means the range could be considerably extended, which would be advantageous for several reasons. The bombers might be able to avoid the use of forward bases, a matter with which I will deal more fully later on, and could probably start from bases within the homeland protected zone. Moreover, they would be able to avoid the direct route to the objective. There is much to be said for following a circuitous route. It enables the bomber to give defended zones a wide berth, and to keep the defense guessing as to its real objective. It might, in certain circumstances, enable the bomber to adopt a route lying mainly over the sea, and thus have a good chance of achieving a surprise, or at least allowing the defense very little warning of its approach.

In his book *Air Power: Key to Survival* Major de Seversky points out the importance to air power of the possession of "inter-continental" or "inter-hemispheric" range. He argues that, in the past war, it was possible to achieve local air superiority because the problem was merely one of "defeating that fraction of the enemy air force which happened to be operative over a particular battle area." He goes on to say that, with the increase of range now possible, "local control anywhere within an enemy's sphere of aerial superiority has become a thing of the past." For the same reason, he holds that forward bases will be untenable. As he puts it:

> Suppose that Soviet Russia possessed powerful air bases close to the American mainland, in Cuba and Greenland, for instance. It is perfectly obvious that we could kill them off immediately after the start of hostilities by hurling against them the full weight of our American bombing power. In such a contest American advantages would be overwhelming. We would be fighting from the source and center of our strength and supplies; the enemy would be dependent on thousands of miles of vulnerable supply lines. We could maneuver our whole Air Force-in-being for conclusive results; the enemy could use only the segment of air force planted on the far-off base. Not only our strategic air power but much of our tactical air force could be thrown into the scales. Even if we did not wish to use these bases ourselves, we could quickly make them untenable for our adversary.

I believe that this is true and that advanced bases, outside the "umbrella" of the homeland defensive system, may well prove to be unusable. If this is so, bombers must have very long range in the future as a matter of necessity, and it may be that this range can be more economically and easily provided by means of flight refueling than in any other way.

With regard to military transport aircraft, long ranges with full load will often

be of paramount importance. Here again, refueling in the air would appear to offer the simplest and cheapest way of providing such ranges.

For civil air transports, one can see that "topping-up" with fuel in the air, after take-off and initial climb, would enable a considerably larger payload to be carried on long flights, such as ocean crossings. Such increases of payload, even after allowing for the cost of providing and operating tankers, might make all the difference between economic and uneconomic operation.

There remains one further point of interest, although concerned only indirectly with refueling in the air. One result of the work that has been done to improve the technique of flight refueling has been the development of high-speed refueling on the ground. Air liners, such as the *Comet*, have to take on large quantities of fuel, perhaps some 3,000 gallons at each stop, and refueling on this scale would take a long time by the older methods. However, if speeds of up to 500 gallons a minute are feasible, the time so taken will be reduced to a few minutes, with considerable saving of time on the over-all schedule. Similarly, the time taken to service bombers and fighters, sometimes of great importance in an emergency, would be much reduced.

It, therefore, seems likely to me that refueling in flight and high-speed refueling on the ground will prove to be of greatly increased value in the future, and that all operational flight planning, both military and civil, will have to take into account the advantages that they can offer. I believe that the Americans have already gained enough experience in Korea to convince them of its possibilities, and it is to be hoped that we in this country, where refueling in flight was first developed, will not hesitate to make a fresh study of its advantages in the changed circumstances of today.

Scandinavia's Strategic Position

Translated and digested by the MILITARY REVIEW from an article by Lieutenant Colonel Sam Myhrman in "Ny Militär Tidskrift" (Sweden) No. 10, 1952.

RUDYARD Kipling's well-known expression "East is East, and West is West, and never the twain shall meet" is no longer true in the light of the present-day world situation. Around the world there are many areas or focal points where the East—the Soviet-dominated Communist bloc—makes contact with the West, and at these points the situation is acute. It suffices to mention Korea, the Middle East, the Balkans, Germany, and Austria.

During recent years, political interest has also been directed toward the Scandinavian countries. The Soviet Union has criticized Danish and Norwegian participation in the Atlantic Pact, as well as Atlantic Pact maneuvers in the Scandinavian area. Moreover, Sweden, although not a member of the Atlantic Pact, has received her share of criticism and adverse moves from the Soviet Union. The Soviets have insisted that the recent autumn exercises of the Swedish armed forces had some connection with the Atlantic Pact maneuvers. Other incidents have included the shooting down, by the Soviets, over free waters, of two Swedish military planes in 1952; espionage affairs; the exchange of notes concerning the newly established Soviet 12-mile limit; and the internment of fishing boats.

The Atlantic Pact has lessened the chances of a third world war, because it is creating a deterrent resistance to the military domination of the East. However,

if war should come, the risk of Scandinavia's being affected will be increased because of Norway's and Denmark's membership in the Atlantic Pact. It may, therefore, be worth while to try to cast some light on Scandinavia's situation, especially its strategic situation from the point of view of air activity.

The Geographic Situation

Considering Denmark, Norway, and Sweden as "Scandinavia," the Scandinavian territory thus constitutes about three-eighths of the total distance from the polar ice cap to the Mediterranean Sea. This means that Scandinavian territory covers almost half of the direct European contact line between the East and the West. If Spitsbergen and the free sea between these islands and Norway are included, this Scandinavian area of interest covers no less than five-eighths of the distance between the polar ice cap and the Mediterranean.

Under the Line of Flight

If we combine the study of the geographical situation with a review of modern technical possibilities, Scandinavia's dominating situation becomes still more apparent. From air bases in the northeastern area of North America, in Greenland, Iceland, and England, the shortest air routes to the greater part of European Russia pass over Scandinavia. This is also true in reverse; that is, with respect to the Soviet strategic air forces (as well as long-range guided missiles) based north and west of Moscow. Scandinavia can truely be said to lie "under the line of flight."

Scandinavian Bases

Undeniably, the flying routes for both the East and the West would be even shorter if their strategic aircraft were not only able to fly over but also to be based in Scandinavian territory. However, the range of modern strategic bombers and reconnaissance aircraft is such that advanced bases, although of value, are not a necessity. On the other hand, Scandinavian bases would be extremely valuable for escorting fighter aircraft.

Scandinavia's real significance in an eventual conflict would, however, by no means be limited only to the providing of short air routes for strategic bombers or advanced bases for their fighter protection. In many respects Scandinavia would be a "focal point." To provide a better understanding of this, a full discussion of the true war aims of both sides is necessary.

The Battle for the Atlantic

The West, for the conduct of a war in Europe, would, among other things, be dependent on secure sea communications over the Atlantic. To cut off or interfere with these would, of necessity, be a primary task for the East—and the submarine would be the primary weapon. The importance that the Soviets have given this task is apparent by the great size of their submarine force. Most of the Soviet submarines are concentrated in the Baltic and the Arctic Ocean areas, but the size of such forces makes it evident that they are not intended solely for the defense of those areas. To reach the offensive areas of the Atlantic, the Soviet submarines would have to pass around the North Cape as well as through the Skagerrak. Keeping these routes open would be of major importance to the Soviets. It is in this respect that Scandinavia's significance in a future battle of the Atlantic stands out prominently.

We can, however, go still farther. Even for modern snorkel-equipped submarines, a shortening of routes would be advantageous. For the Soviet submarines, this would be possible if bases could be obtained on the Scandinavian Atlantic coast.

Experience during the last war proved the value of aircraft as an antisubmarine

weapon as well as for providing protection for submarines. Bases in Scandinavia for tactical aircraft would be desirable for both sides in the event of a war against ocean commerce.

A Thorn in the Side

An attack from the East over the European Continent would leave the northern flank open in the direction of Scandinavia. With bases in southern Scandinavia, the West would have good possibilities for air attacks on the East's extended lines of communication through Poland and Germany and across the Baltic. A situation such as this would be a "thorn in the side" of the East's offensive. The risk of such a flank threat could drive the Soviets into taking steps to prevent such a situation from occurring.

A Focal Point

Even what we have already said indicates that Scandinavia will be one of the focal points in a conflict between the East and the West. It is situated "under the line of flight" and it is an especially desirable base area for both sides.

Thus far, nothing has been said about Scandinavia's status in a future war. In this regard, we must anticipate several possibilities.

It is possible that a situation could exist wherein all three of the Scandinavian countries could remain neutral (at least initially) in the event of a future conflict. For such a situation to come about, a joint Scandinavian declaration of neutrality would be required. This would mean a strict maintenance of neutrality toward both sides. If this neutrality were not respected, force of arms would be required. However, would neutrality be possible now that Denmark and Norway are members of the Atlantic Pact?

With the geographical and political situations as they are, the fact cannot be ignored that a strict, armed Scandinavian neutrality—at least initially—would give the West numerous advantages. However, Soviet neutrality being what we know it to be, it is indeed difficult to imagine a neutral Scandinavia having any possibility of being at peace.

With Denmark and Norway being signatories of the Atlantic Pact, there are greater possibilities of Sweden's remaining outside of an eventual conflict than of either of the other two Scandinavian countries.

A strict and well-handled Swedish neutrality could, perhaps, at least initially, induce the air forces of both sides to choose routes away from Swedish territory. This would apply particularly to the Soviets, since they would have less to lose by such an arrangement. However, there is another important factor to be considered. The Soviets have a large portion of their submarine force in the Baltic, and complete control of the Baltic outlet is not possible without access to the Swedish area. Any similarity to the situation existing in World War II would be erroneous, for Germany (in contrast with the Soviet Union) possessed ports on the Baltic and full control of the Kiel Canal. Thus, Germany's naval forces could be moved from the Baltic to the North Sea (and vice versa) without touching foreign territory. Therefore, the problem of the outlet of the Baltic (particularly the Sound) must be regarded as considerably more difficult.

Another point should also be considered. Can a great power like the Soviet Union accept the risk of an open flank, even though this, in part, is turned toward a country which has declared itself neutral? In view of the distrust that the Soviets have often shown of honorably made declarations, one should count on the risk of Soviet preventive measures against the area around the Sound, as well as against southern Sweden. How great this risk is depends to a great extent upon whether the Soviets can respect and agree

to a Swedish declaration of neutrality. However, the Swedish-Soviet exchanges of notes concerning the Soviet territorial water limits and the shooting down of planes do not give us any grounds for optimism in this direction.

Swedish territory is of interest to the Soviet Union for still another reason. Any attack by the Soviets against Norway would be resisted by the Norwegians and the other signatories of the Atlantic Pact. In order to achieve success in such a venture, the Soviets would be obliged to engage very powerful ground and airborne forces. These, in turn, would require strong air support and an extensive supply service. As far as air support is concerned, this could hardly be provided without touching Swedish territory, except in the arctic region of the north. From the point of view of military technique, it would seem necessary for the Soviets (with a continuation of their ground warfare against Norway) to move their bases and rear supply organization gradually into the Swedish area. It is, therefore, hardly possible that the Soviets would be able to occupy Norway without Sweden becoming directly involved.

Conclusion

If a third world war breaks out between the East and the West, there would be a great danger of Scandinavia becoming one of the focal points of this conflict.

If such is the case, it is hard to believe that any of the Scandinavian countries—Norway, Denmark, or Sweden—would have a chance of remaining outside of the direct military operation.

Stalin's 'New Asia'

Digested by the MILITARY REVIEW from an article by Harry Schwartz in "The New York Times" (United States) 30 November 1952.

SOVIET Asia, that vast subcontinent from the Ural Mountains to the Pacific, holds much the same promise for Russia's future today that our own West held for this country a century ago, when Horace Greeley counseled: "Go West young man." With the Russians it is "Go East comrade," and under the new Soviet Fifth Five-Year Plan this perennial frontier is apparently destined for the most intensive agricultural and industrial expansion in its history.

The accompanying map shows clearly two of the reasons for modern Russia's interest in Soviet Asia. The first is its huge size—Siberia and the rest of Soviet Asia are twice as big as the United States—with lots of room to disperse munitions plants and other factories to guard them from attack by land or air.

The second reason is that Soviet Asia is already one of Stalin's major industrial areas as well as an incredibly rich storehouse of nature's treasures. As the map shows, this area has many factories and railroads, in addition to iron ore, coal, nonferrous metals, gold, and potential sources of hydroelectric power in abundance. It has millions of acres of rich timberland and other millions of acres for farming and cattle raising.

Today this entire great region is mainly empty space. It supports fewer than 50 million people and, even including the Urals, has a population density of only about 7 persons for each square mile.

Harsh climate is the chief reason for this sparsity of population. Winters are long and much of a man's energy must go into fighting for simple survival against

the hazards of sustained below zero temperatures. The summers, over most of the region, are too short for conventional agriculture. In the southernmost section, Central Asia, summers are long and hot enough to grow cotton, rice, and other subtropical crops, but a great deal of the land is useless desert. Little wonder that much—though far from all—of the development of Soviet Asia under Russian rule has been made possible only by the use of slave labor.

To develop Soviet Asia in the face of these obstacles, the Kremlin must build major hydroelectric power plants, new canals and irrigation works, new factories and mines, and new railroads. In this work the experience already gained during the past 25 years will be put to use, as well as the discoveries of scientists who have evolved new breeds of plants and animals, better suited to climatic extremes. For the more distant future, Kremlin technicians talk of using atomic power to change the course of giant rivers and to provide heat and power to make the frozen wasteland productive.

Soviet Asia is already providing many of the sinews of Kremlin strength today. It will provide more tomorrow.

Soviet Asia, extending from the Ural Mountains to the Pacific Ocean, includes about two-thirds of the land area of the USSR. This map shows the area's major production centers, its railroads, and the key sources of power and minerals upon which the major industrial expansion projected in the Kremlin's Fifth Five-Year Plan will be based.

Medical Problems of Atomic, Biological, And Chemical Warfare

Digested by the MILITARY REVIEW from an article by Brigadier A. Sachs in "The Journal of the Royal United Service Institution" (Great Britain) August 1952.

THROUGHOUT history, developments in weapons of destruction have continued to set new medical problems, and it seems likely that this may have occurred even in primitive times. Prior to the introduction of the spear, early man was acquainted only with contused injuries resulting from the blows from a club, and a new medical problem was to deal with the deep lacerated wounds caused by the spear. Later, with the advent of firearms, the removal of deep-seated bullets and shell splinters became, and even today may still be, a difficult problem. The result of the launching of gas warfare in World War I on the unsuspecting allies illustrates the consequences and chaos caused by the absence of adequate preparations for defense against new weapons and for treatment of the resulting casualties. The introduction to atomic warfare by the bursting of the atom bombs over Hiroshima and Nagasaki again serves as an example of the results of this unreadiness.

The weapons used in modern scientific warfare aim at mass destruction, and have created medical problems of a magnitude never previously visualized. It is problematical whether these weapons of mass destruction will in fact be used in the face of the many so-called humanitarian, ethical, and moral objections which have been raised, or, if used against a well-prepared nation, whether much success could be accomplished in the presence of adequate defensive methods.

The medical side of defense in a future war will affect the well being, morale, and possibly even the survival of a nation. If the medical resources of the country are to be effective, there must be full co-ordination between the medical services of both the civil defense organization and the armed forces.

This consideration forms an integral part of planning. It is of the greatest importance that a correct appreciation should be made of the many and various medical problems which are likely to arise when considering defense against special weapons, in order that there is no wastage of medical manpower or medical equipment and drugs.

Civil defense planning before the onset of hostilities must aim at minimizing the effects of modern warfare on the civil population. As a preliminary, arrangements should be made to reduce the number of individuals who may be potential casualties in target areas. One method is that used in the last war—the selective evacuation of mothers and children and others whose presence would not be essential to the national effort. By long-term planning for the dispersal of industries, a further reduction in population densities can be ensured. A firm policy regarding shelters and methods of warning will also help to reduce the number of casualties.

The medical problems arising in a future war will no doubt be influenced to a great extent by atomic, biological, and chemical warfare.

Atomic Warfare

The most obvious targets for an attack with atom bombs are key cities of strategic and industrial importance which are vital to the national effort. Much of the data available on the effects of atom bomb explosions have been derived from the attacks on Hiroshima and Nagasaki and various trials carried out by the United States in certain islands in the

Pacific. Owing to the difference in the structure of buildings, it is not possible to apply the Japanese experience directly to any European city.

It is well known that when an atom bomb explodes, energy liberated in the form of blast, heat, and radioactivity is capable of causing death or injury to the population, structural damage, and contamination of water and food supplies.

The problems facing the medical services after an atom bomb explosion are associated with the treatment of large numbers of injured and with the prevention of further casualties from residual radiation and contaminated food and water supplies. People in a city may be killed or injured by (1) the direct effects of blast, (2) secondary effects of blast resulting from flying debris and shattered glass, (3) flash burns, (4) secondary fires, and (5) radioactivity—either the penetrating gamma rays and neutrons liberated at the time of the explosion or the residual radiation remaining afterward on the ground and in any contaminated food and water supplies.

Blast and Burn Injuries

When British cities were attacked with high explosives and incendiary bombs during the last war, the medical services had to deal with injuries caused both by the direct and secondary effects of blast and burns resulting from fires. After an atom bomb explosion the actual injuries will present no new problems in treatment except when complicated by radiation effects; the new problem will be the magnitude of the numbers of casualties. Some idea of the size of the surgical task facing the medical services can be gathered from the fact that, during the last war, it was shown that it is humanly impossible for one surgical team to carry out more than 12 major operations in 24 hours. It would, therefore, require 84 teams to deal in 24 hours with a thousand serious casualties requiring urgent operations. This will necessitate the availability of teams fully equipped with instruments, dressings, splints, and drugs, which in itself creates a considerable planning problem.

Flash burns occurring at the time of the explosion are peculiar to atomic warfare and were extremely common in the exposed population in Japan. These burns are due to thermal radiation ranging from infrared to ultraviolet rays acting over an extremely brief period of time. If the entire population has taken cover in houses or in shelters before the bomb is released, they should be protected and flash burns should be rare. With an exposed population like that of Hiroshima and Nagasaki, or an army in the field, the circumstances will be different and flash burns are likely to predominate over other types of injury.

The effects of thermal radiation will depend on distances from the center of the explosion, protection afforded by shielding and clothing, and atmospheric conditions. In Japan, flash burns occurred within a radius of 4,000 yards. Those within a 1,000-yard radius of the center of the explosion were so severely burned that the majority died from their injuries. Beyond 3,000 yards, however, the effects of thermal radiation were mild, the injuries on the exposed parts resembling severe sunburn. Between these two distances burns of varying degrees of severity were encountered. Since flash burns occurred only on the surface facing the detonation, shielding and shading by structures afforded protection and reduced the number of casualties. At distances greater than 1,500 yards, loose fitting, light-colored clothing seemed to afford some protection. Mild cases can be prevented by wearing gloves and by covering the face and other exposed parts before the explosion. The minor traumatic injuries and mild burns will outnumber

the serious casualties. Skilled medical attention is unlikely to be available for some time to treat these mild cases, since all medical personnel will be fully occupied in dealing with the more seriously injured. It is, therefore, evident that there must be some system of mutual help and first aid. This stresses the importance of the necessity for training the civil population in first aid or at least in its rudiments. A civil population so trained will do much to alleviate the pressure on what will be an overworked and harassed medical service.

Radiation Injuries

Radiation injuries are also peculiar to the atom bomb explosion. There has in the past been a tendency to emphasize unduly the importance of the casualties occurring from radiation injury. Although from the serious nature of the injury sustained, the group is undoubtedly important, numerically its importance is less than that of casualties from the mechanical and thermal effects of the explosion; the relative proportion being 20 percent from radiation and 80 percent from mechanical and thermal injuries combined.

Medical science has long been familiar with the effect of the localized use of radiation for the treatment of cancer, but not with the effects of radiation on the entire body. The clinical effects resulting from radiation depend on the dosage received at the time of the explosion. It is most important that an assessment should be made at the earliest opportunity as to whether individuals have been exposed to radiation and, if exposed, the probable dosage received, in order to separate radiation casualties from others. Attempts to separate the population into these categories may be based on (1) the distance from the explosion, (2) readings from personal monitoring instruments, and (3) symptoms. Each of these three methods has its disadvantage. The absence of knowledge of the amount of shielding, the size of the bomb, the height of the burst, and the effect of terrain and buildings will preclude an accurate assessment based on distance. The personal dosimeter may give a fallacious reading when part of the body is shielded or the dosimeter shielded and the body exposed. An assessment of symptoms is not perfect, as the susceptibility of individuals varies. It was found in the Japanese cases that an early onset of the characteristic symptoms was indicative of exposure to a high dose of radiation. Those whose symptoms developed late were generally assumed to have received a smaller dosage. Indeed, it came to be realized that the earlier the onset of symptoms the worse the chances of recovery.

Three Main Categories

For convenience patients have been grouped into three main categories, namely:

1. *Those receiving a lethal dose of radiation.*—In such cases, severe vomiting and diarrhea came on within 1 to 3 hours and fever and marked wasting developed within 1 week, by the end of which time the majority had died, though some survived for as long as 2 weeks.

2. *Those receiving a large, but not necessarily lethal, dose.*—The onset of symptoms was delayed until the end of the second week after exposure. These consisted of loss of appetite and malaise, diarrhea and some wasting, and loss of the hair. Recovery largely depended on good nursing.

3. *Those receiving a low dose.*—Symptoms of the foregoing type were present to a slight degree after the second week or were entirely absent.

An examination of the blood of casualties by counting the different types of blood cells gives a fair indication of the severity of the illness and a check on its progress. It is the best means of assessing

whether a blood transfusion is necessary or not and, if necessary, the amount of blood required. The assessment of the degree of radiation injury and the giving of transfusions are among the major medical problems.

Blood and plasma are commodities even now in short supply and will be in great demand in warfare for the treatment of all the different types of injury, whether caused by the atom bomb or other weapons of destruction. Under ideal conditions, blood cannot be stored for longer than 21 to 28 days, mainly because of degenerative changes in the red blood cells, but the plasma will keep for several years. Plasma is particularly valuable in the treatment of burns, but blood is required for all types of injury where there has been severe blood loss and also for the treatment of cases of injury resulting from radiation. It seems most improbable that sufficient blood and plasma will be available in any country to deal with more than a limited number of atom bomb "incidents."

Research work is being carried out in many countries to discover an ideal substitute for blood and plasma. During World Wars I and II, a number of substitutes for blood were used both by the allies and by the enemy; but all had serious disadvantages. The Swedish product dextran has been used with success in England and the United States, but is still far from the ideal.

World War II demonstrated the size of the organization necessary for the maintenance of an adequate blood transfusion service to meet the needs of the civilian population and the oversea forces. This effort will have to be increased considerably in any future war and, even prior to the outbreak of hostilities, arrangements must be made to have stocks of plasma and blood substitutes available. Training will be essential to ensure that the necessary technicians are available to carry out transfusions, blood counts, and blood grouping.

Residual Radiation

An important task of the medical and health services will be the prevention of further casualties among rescue workers and others as a result of undue exposure to residual radiation or the ingestion of contaminated food and water supplies. The quantity of radiation an individual can stand either externally, or internally from ingestion or inhalation, without harmful effects (either immediate or after the passage of time) is known as the "tolerance dose." This amount is based on an absence of clinical effects to a single exposure or to multiple smaller doses spread over a period of time. Exposures to doses in excess of the tolerance dose are likely to be followed by casualties and consequently constitute a hazard. It is not unlikely that circumstances may arise when it will be necessary to send rescue squads, bodies of troops, or others into a radioactive area, and the amount of residual radiation present may be so high that working in these areas would result in casualties. The decision as to whether parties should be sent into such areas will be the responsibility of the controller or commander on the spot, who will have available tables to indicate the number of casualties which are likely to follow exposure to different doses of radiation. From these and the information available as to the quantity of residual radiation being emitted, he will be able to assess the advisability of exposing individuals to the risk.

Hazards from exposure to radiation are not a new experience. Several years ago the maximum dosage of radiation to which an X-ray worker could be exposed was laid down, and rules were drawn up for the conduct of X-ray rooms to minimize the chance of overexposure and for the regular examination of personnel to

detect early physical changes which might result from such overexposure. Radioactive material may be absorbed into the body by inhalation or ingestion and through injured skin surfaces. The effects of radioactivity within the body have been long recognized as an industrial hazard. From 1920 onward, cases of radiation injury occurred in luminous dial painters who moistened with their saliva the tips of brushes which had been dipped in radioactive paint, and also in uranium miners in Czechoslovakia. Radiation injury may thus arise from an external source of penetrating radiation, and from absorption into the body through ingestion or inhalation.

The intensity of radiation given by the fission products resulting from an atom bomb explosion dies down very rapidly. The hazards resulting from residual radiation will vary with the different types of burst. After a high air burst the rising "ball of fire" carries the products of the explosion upward, and the powerful rising air currents produced by the blast and heat disperse this material so effectively into the surrounding atmosphere that only in exceptional circumstances will the radioactive particles falling to earth constitute a hazard. In the case of a low-level ground or underwater burst, however, residual radiation may constitute a very serious problem because of the "fall out" of radioactive material. In assessing the radiation hazards of an area, it is essential to differentiate between remaining in the contaminated area for prolonged periods, and entering it for rescue operations; in the former case the dosage received by an individual remaining in the area for 24 hours may result in serious injury or death, but in the latter that received by walking through the area or remaining there for a short period of, say, 15 to 30 minutes is unlikely to have any harmful effects.

The type of burst also requires consideration when assessing the risk of contamination of food and water supplies. After a high air burst, serious contamination of water supplies in reservoirs or other parts of the water purification system would be unlikely. As mentioned previously, radioactivity resulting from the "fall out" of fission products to the ground would be small, but an explosion at ground level or an underwater burst might produce very heavy contamination in open reservoirs, and might be so serious as temporarily to preclude the use of water for cooking and other domestic purposes. The length of time that the water would remain unusable will naturally depend on the degree of contamination. It will be an important duty of medical officers to evaluate the analysis of water supplies. It should be noted that chlorination and boiling will not destroy radioactivity. This may be removed, however, by the usual processes of sedimentation and filtration. The disposal of radioactive waste from the filtration plant will be difficult, and it may be necessary to bury this waste to avoid contamination of sewers. It should be noted, however, that the normal decay of radioactive particles will rapidly reduce contamination to safe levels in the course of time.

Food is likely to be contaminated after an atom bomb burst, but it can be assumed that tinned or canned food, if the tins are undamaged, and food in sealed packages or in refrigerators can be used provided care is taken to wash off any dust or moisture from the outside of the container. It will be one of the duties of medical officers to help to determine whether perishable or nonperishable foods from stores, markets, and restaurants within the zone of residual contamination are fit for human consumption. The cooking and boiling of food will not destroy radioactivity.

Casualty Estimations

A general survey has been given of the main problems which will face the medical services in atomic warfare, but the magnitude of their task will be better realized when estimations are made of the total number of casualties which are likely to occur after the explosion of an atom bomb of similar power to that used on Japan.

A recent assessment of casualties for a British city is shown above.

For comparison, separate estimates were made on the hypothetical assumption that the entire population is placed in turn in (1) houses, and (2) reinforced brick surface shelters of the type used during the last war. The effect of shelter is to reduce the number of both killed and injured to less than half of that which would have occurred if all had been inside houses, and to about a quarter of the estimate for an exposed population caught unaware in the open.

The location of the population at the time of the explosion will determine the ratio of the different types of injuries. If the Japanese experience is used as a basis for determining the percentage of the different types of casualties for exposed populations, it may be assumed that, of the survivors, 60 percent will be suffering from burns, 50 percent from traumatic injuries, and 20 percent from radiation injuries (a number of the casualties will be suffering from more than one type of injury). Theoretically, if the entire population is in houses or shelters, there should be no casualties because of flash burns, and 80 percent of the injuries will be of the traumatic type resulting from the secondary effects of blast. The remaining 20 percent of the injuries will be due to radiation and burns resulting from secondary fires.

It is obviously impossible to predetermine the circumstances which may exist at the time of an atom bomb attack. Preparations are likely to prove inadequate if these are based only on the supposition that every one will be in reinforced brick shelters. Most likely there will be a combination of different circumstances. It does, however, appear that an estimate of casualties based on the assumption that the entire population will be in houses can provide a satisfactory basis for assessing the medical problem. The data available on the types of casualties produced during the bombing of cities in the last war are a valuable guide for calculating the possible proportion of the seriously injured who will require urgent surgical treatment.

TOTAL CASUALTIES FROM ONE NAGASAKI-TYPE ATOM BOMB ASSUMING A POPULATION DENSITY OF 43 PERSONS FOR EACH ACRE

TYPES OF CASUALTY	EVERYONE IN HOUSES	EVERYONE IN REINFORCED BRICK SURFACE SHELTERS
KILLED OUTRIGHT OR TRAPPED IN DEBRIS	30,000	10,400
DELAYED RADIATION DEATHS	1,100	3,900
TOTAL KILLED	31,100	14,300
INJURED NOT AFFECTED BY RADIATION	27,000	1,800
INJURED BY RADIATION	2,500	8,700
TOTAL INJURED	29,500	10,500

3-1602

Although this article has primarily assessed the medical problems from a civil defense point of view, the general principles are equally applicable to an army in the field where the question of sheltering will be of great importance.

Biological Warfare

Biological warfare is a weapon as yet untried in war, and one for which the most extravagant and unrealistic claims have been made. This type of warfare may be defined as the dissemination of living germs or their poisonous products (toxins) to cause death or disease in humans, animals, or plants. Assuming that man will be able to use biological warfare as a weapon—and there is by no means any certainty of this—it is theoretically possible that sickness can be spread deliberately among selected groups of a community and lead to disruption of industry, chaos in the everyday life of a nation, and disorganization of a force. If attacks were directed against animals and crops, they could lead to serious food shortages.

A number of statements have appeared in the press in recent years about the horrors of biological warfare and the terrible nature of this weapon. However, when the pros and cons are examined impartially, would the use of this weapon really be so inhuman? It is a weapon which is only effective against living things, and which does not cause structural damage. Therefore, its use is not attended by the destruction and devastation caused by *V* weapons and conventional incendiary and high explosive bombing, from the effects of which this country is still suffering.

Is a direct attack on man with a biological warfare agent, which still leaves him with the resources of modern medicine as a countermeasure, any less humane than an attack by explosive, fire, or bullets, let alone the atom bomb?

The concept of biological warfare is not new. Man in his age-long struggle has been continuously on the defensive against biological warfare waged by nature. He has had to develop a defense against insidious attacks which in the past have led to epidemics like the Black Death in the fourteenth century, when about a third of the population of Europe perished; the Plague in the seventeenth century, which disrupted the life of London; and, in more recent times, the influenza epidemic in 1918, which caused more deaths in a matter of months than did bullets and shells in the 4 years of war. In past centuries the louse, by spreading typhus; the rat and flea, plague; and the mosquito, malaria and yellow fever, had a greater bearing on the course of campaigns than generalship. Up to World War I, deaths from disease in war far outnumbered those from firearms.

To wage biological warfare successfully, man must adopt the mantle of nature. However, it is evident from the present-day spread of diseases, such as infantile paralysis, influenza, measles, and foot and mouth disease, which cannot be prevented, that scientists have much to learn before they can emulate nature. Bacteriological research must be intensified to ensure that defensive measures are so satisfactory that it would be impossible for biological warfare to be waged successfully. Such research must also be directed to a study of the mechanism of the spread of epidemics.

Defensive measures against biological warfare agents must be based on the fundamental principles of public health for preventing the spread of disease. It, therefore, follows that any country which has a well-organized public health service also has available the nucleus of a defense organization which can be adapted to meet unnatural outbreaks of disease; but planning must be integrated with any general defensive plan.

The first requisite in any scheme for defense is the provision of adequate facilities for the detection and identification of biological agents. The identification of germs is at present a highly skilled and laborious procedure. Specially fitted laboratories, staffed with trained bacteriologists and technicians, are necessary. It is obviously desirable that efforts should be made to speed up techniques so that possible biological warfare agents can be identified rapidly.

Humans and animals can only be infected by three routes, namely: *inhalation* from the air, for example, the common cold; *ingestion* of infected food or water, for example, typhoid and dysentery; and through *the skin surfaces and mucous membranes*, for example, tetanus by development of infection in a wound, or malaria from the bite of a mosquito.

The *first line of defense* is, as always, the prevention of the infecting agent from reaching the victim. The gas mask will afford physical protection not only against the inhalation of chemical but biological warfare agents as well. Clothing impregnated with certain repellant chemicals did much to minimize the number of casualties from scrub typhus in Burma and Malaya; this is another type of physical protection. Food and water supplies are always likely to be infected either accidently or deliberately. These vehicles of infection are those obviously likely to be used by a saboteur. Water discipline as practiced in the Army and the consumption of well-cooked, hot food should do much to minimize the risks from these sources.

However, there is always a possibility that these barriers to infection may break down, and allow the infecting agent to find its way into the body of the victim. This necessitates a *second line of defense*, namely, preventing the development of disease once infection has taken place. This is done by increasing resistance and is generally referred to as immunization. This can only be carried out when sufficient time is available and the probable infecting agents known. It is a long-term policy, and the immunization of a large population (known as mass immunization) against a number of diseases is practiced in the services. Basically, every serviceman is protected against smallpox, typhoid fever, diphtheria, and tetanus. When at special risk he is also inoculated against cholera, plague, and typhus. A potential enemy naturally will not use an agent against which a community is likely to be protected. It is improbable, however, that the state of immunization in the civilian population can be as satisfactory as that in the services.

It is, therefore, necessary to have a short-term policy, available for use after an agent has been identified, when infection is likely to occur among nonimmunized persons. This is the practice adopted for the protection of contacts of infectious disease.

Finally, if these prophylactic measures fail and disease does develop, it is essential that the resources of modern medicine are available to reduce the time of disability to a minimum.

To summarize: medical problems in biological warfare will include the rapid detection and identification of agents used; the protection of individuals by immunization, when time permits and possible agents are known; the prevention of the development of disease once infection has occurred; and, finally, the treatment and cure of the stricken.

Chemical Warfare

Since World War I, developments in the field of chemistry have been overshadowed by those in physics, particularly nuclear physics. This has led to the development of an outlook in which the potentialities of chemical warfare have tended to be

ignored or forgotten. Although chemical warfare was not used during the last war, it must not be assumed that this type of warfare will not be used in the future. After their defeat it was discovered that the Germans had available large stocks of the older-known types and of some new types of chemical warfare agents.

It is not known definitely why Hitler did not use chemical warfare against this country. A probable explanation is that the enemy was aware that, owing to the state of preparedness for defense against this type of warfare by the agents then available, any attack was likely to be unsuccessful or only partially successful. Further, he probably hoped to win the war without the use of chemical warfare and the odium which would follow. Later, however, when the new agents were available, he had lost air supremacy, and the opportunity for the use of chemical warfare had passed. It is, therefore, obvious that the potentialities for a successful attack with chemical agents must depend directly on the state of preparedness of the nation or services. These preparations must ensure that the medical profession has adequate knowledge and training for the prevention or early treatment of casualties.

The study of chemical agents, whether used for the destruction of man or to cure his ills, or whether to destroy plants or insects or to fertilize the ground, follows certain basic principles. Physical properties, such as stability, solubility in water or other fluids, and the effect of temperature, must be ascertained. The physiological and pharmacological action on man and animals must be determined, so that the requisite knowledge is available as to how the substance works. The effects of different doses, including those which have harmful or toxic effects, must be investigated and antidotes be prepared to combat them.

Most of us have heard of the important chemical agents used in World War I—chlorine, phosgene, mustard, and lewisite. A great deal of research into the action of these agents on man and animals, and the best means of treatment of casualties caused by them, was carried out during the inter-war years.

It is interesting to note that during the investigation into some derivatives of mustard gas, it was found that nitrogen mustards appeared to have a therapeutic action on certain types of blood disease, and further research is now being carried out into this beneficial use. Veritably a case of good coming out of evil!

It must not be assumed that merely because a good deal is known about the potentialities of the chemical agents used in World War I, and the appropriate countermeasures to minimize their effects, that at least some of them would not be used in a future war. However, the main interest of the medical profession is centered around the newer types of war gases which were discovered in Germany at the end of the last war. These are commonly referred to as the nerve gases, because they interfere with the transmission of impulses along the nerves by causing a block at the junction of the nerve ending with the muscle fiber. This may be compared with a break in an electric wire which prevents the flow of current.

The effect of poisoning by nerve gases leads to paralysis of the muscles carrying out respiration and a constriction or narrowing of the air passages in the lungs similar to that encountered in cases of asthma. Other symptoms are due to contraction of the pupil of the eye which interferes with vision. Casualties can be caused either by external liquid contamination or by the inhalation of vapor, and are likely to occur with extreme rapidity. In contrast with the nonirritant war gases, there is no lag period between the contamination or inhalation of vapor and the manifestation of symptoms.

In severe cases it is the interference with respiration that constitutes the gravest menace to life and requires the most urgent treatment. Physiologists and pharmacologists have been investigating these problems. It has been found that the early administration of atropine is the best line of treatment, but it is emphasized that this must be given early. Since atropine is the principal therapeutic agent, the correct dosage should be available in a readily usable form, such as in a syringe for self-injection. Artificial respiration may be required to restore natural breathing after severe poisoning.

One important task of the medical services in the field will be to decide when a man who is a nerve gas casualty can return to duty. At present, this decision can be based only on laboratory findings. The technique for these determinations is complicated and requires special apparatus.

Such is the nature of the problems confronting the medical profession in the prevention and treatment of casualties resulting from chemical agents. Ever since chemical warfare has been used the gas mask has been the first line of defense and must remain so. It is, therefore, of the greatest importance that gas masks fit properly and that both civilians and service personnel are familiar with gas-mask drill.

Commentary

Details have been given of the many and varied problems which the medical services will have to face should atomic, biological, or chemical warfare be used. Some of the problems will have been encountered previously either in dealing with casualties caused by conventional weapons used in the past, or during the routine treatment of disease; others will be new. It will be the number and variety of the problems which will strain the medical resources of a nation.

The scope of the responsibilities which the medical services will be called upon to undertake in the preservation of morale, the conservation of health, and the treatment of sick and wounded, both in civil defense and the services, makes it imperative that this should be fully realized in all stages of planning to ensure that medical manpower is not dissipated.

What of the future? Will the biological sciences make advances during the next decade similar to those made in the field of nuclear physics during the past decade? If so, will the knowledge be used for the benefit or the destruction of the human race? The future and even the ultimate survival of man may depend on the answer to this question.

In preventing war, the influence of modern technology—especially in the atomic field—can be a deterrent power. It has been up until now. But science and research are not weapons for us alone. They can easily be weapons for the aggressor also. When a potential enemy achieves relative strength in atomic and other untried weapons, the deterrent effect of our atomic capabilities diminishes.

General of the Army Omar N. Bradley

Sea Power or Conscription?

Digested by the MILITARY REVIEW from an article by Rear Admiral G. P. Thomson in "The Navy" (Great Britain) August 1952.

WHILE a minority of our country question the size of our rearmament program and believe that it is overtaxing our resources, the vast majority are in favor of it and realize why it is necessary. They know that British troops and air forces may be required to take a large share in defending an area west of the Elbe, pending the arrival, under the protection of North Atlantic Treaty Organization (NATO) navies, of sufficient reinforcements to offer effective resistance to a Soviet invasion of Western Europe. They know, too, that we shall not be helping to defend Western Europe solely from philanthropic motives, but equally to protect ourselves, for airborne divisions, guided *V-2* rockets, and atom bombs launched from enemy-occupied ports across the Channel and North Sea would test to the utmost this country's capacity to endure.

There is, however, very little awareness of what would happen subsequently, assuming, as it is hoped, the Soviets would be held. Are the NATO nations to undertake the stupendous task of driving the Soviet armies back into their own territory until they are routed and forced to surrender? The German armies had to be defeated in both world wars, and it is perhaps natural to assume that the grand strategy against the Soviet Union would be similar.

A NATO Land Offensive

A land offensive by the NATO armies would, of course, be just what the Soviets would wish. They would then be able to exploit their greatest asset—an unlimited supply of manpower. Moreover, it would prevent us from concentrating on what should be our major effort—the exploitation of NATO sea power. Atom bombs, aircraft with supersonic speeds, guided missiles, and other modern developments have not diminished the value of sea power. On the contrary, they have greatly enhanced its value, for sea power enables these weapons and missiles to be taken where they can be used most effectively—to the vicinity of the enemy's territory.

The Soviet Union is a vast land with her centers of population and industry distributed over wide areas. None the less, she and her satellite countries are very vulnerable to the invasion and capture of their coastal areas—the kind of offensive which is always open to a belligerent who has command of the sea. There is far more discontent among these nations than is generally realized. Amphibious operations by NATO forces would encourage, and bring into the open, underground movements—especially in the satellite countries.

Attacks Against Communications

A still more effective method of immobilizing the Soviet Union's armies and bringing home a war to her people is by attacking her communications and war potential establishments—by bombing her railways, canals and bridges (which are far from adequate even for her peacetime requirements), her power stations, factories, and dockyards. Air enthusiasts in the United States—and to a lesser extent also in this country—maintain that this is a job for the Air Force, but there is little doubt that it would be carried out more effectively by medium-range bombers from carriers operating off her coasts. The Korean campaign has indeed done much to disprove the theory that the very large piston-engine bomber, flying at 400 miles an hour at 40,000 feet, cannot be inter-

cepted by jet fighters and requires no fighter protection. On the other hand, a medium-size bomber, adapted for carrier work, should be able to reach any worthwhile bombing target, and could be given fighter protection over much of the route.

In a word, then, the main problem for the NATO nations in the unhappy event of a war against the Soviet Union will undoubtedly lie in limiting the scope of ground operations in Europe while they concentrate on exploiting their sea power—and the mobility given to air forces by sea power—to the best advantage. But what of the future? Under modern conditions offensive operations across the seas, whether they be amphibious operations or the bombing of the enemy's war potential establishments and communications, require task forces, each comprising a substantial force of carriers and cruisers, as well as destroyers or antisubmarine vessels to escort them.

During the present emergency, it is clear that we must rely on the United States to provide by far the larger portion of the task forces of the size and numbers required. With the *Eagle*, the *Ark Royal* now nearing completion, and the four Hermes class to be completed in 1955, Britain will have a total of only 12 carriers with the necessary speed and performance to operate in enemy waters against shore based aircraft. And even this small number, if they are to operate against shore based aircraft, depends on the modernization of the Illustrious class—a modernization which may be impracticable if we are also to have an adequate number of smaller carriers for antisubmarine operations. The cruiser position is even worse, for we have now only 24 of these vessels to provide support for task forces and to guard the many focal areas of trade which may be attacked by cruisers or, more probably, by armed raiders disguised as peaceful merchant ships.

Future Policy

What, then, is to be the future policy for our armed forces? In the long run, when the present emergency is over and the French and other European armies are re-equipped and again up to their prewar strength, we shall have to choose between sea power on the one hand and conscription for the provision of a large army on the other. We cannot afford both, and there can be little doubt what that choice should be. The British people are proud of their country and of the prestige and influence she has exercised for generations through sea power. They will not be prepared forever to rely for their safety on the United States.

Nor would it be safe to do so. If the United States has replaced Britain as the greatest and most powerful nation in the world, this does not necessarily mean that she will always be willing to come to our assistance or to intervene in European quarrels—particularly if the spread of communism is seen to be checked. Britain has suffered grievously in two world wars within a period of 30 years, but we can and must again stand on our own feet by rebuilding the sea power which made us great.

The first essential is to rebuild our antisubmarine and minesweeping forces—as we are doing now—to counter the immediate threat to our sea communications. But wars are not won by antisubmarine vessels. Our ultimate goal should be a Navy able to take the offensive in war and to ensure that in peace this country once again plays an effective role in world affairs. Under modern conditions, this entails the building up of an adequate number of carriers and cruisers, which represent the striking power of a navy. However, in the not too distant future the carrier may well be supplemented by a new type of capital ship—fast and relatively small, with a main armament of guided rocket platforms.

THE LIFE AND DEATH OF STALIN. By Louis Fischer. 272 Pages. Harper & Brothers, New York. $3.50.

BY LT COL WALDEN F. WOODWARD, *Inf*

Mr. Fischer's story contains the startling, but now familiar, story of how a political party took control of a country, how a machine politician took over the party, and how the dictator then got rid of the party. The methods used by Joseph Stalin to accomplish the latter end are related in some detail.

The author has assembled a great deal of information on his subject. Unfortunately, this information is scanty, and since the late 1930's has consisted primarily of observer reports based upon interviews and brief appearances of Stalin at such places as Yalta and Potsdam.

Stalin has been guided by four simple rules for success: any method is justified if it helps achieve the desired end; men must be discarded when no longer useful; alliances are made to be broken; and ideas have no existence unless chained to the chariot of power.

After World War II, the Soviet Union was left without hostile elements at home or abroad. The guns-instead-of-meat-and-houses program could not be maintained without tension of some sort. This tension Stalin created by rejecting the general good will among the allies, and by deliberately instituting tensions between the Soviet Union and other countries. The Soviet Union is unwilling to gamble with her national existence and imperial strength. Hence, despite her overwhelming military power, she desisted where she met opposition: Iran in 1946-47; Greece and Turkey; and the Berlin blockade. Her current policy is to equalize the balance between the two worlds by prolonged, wasteful guerrilla wars in non-Soviet countries or colonies or by social upheavals which are not always fomented by Moscow but are never discouraged by Moscow.

The final chapter, dealing with the death of Stalin, is somewhat premature at this time. The author uses this title to suggest the likely emergence of a condominium after the death of Stalin probably centering about Beria and Malenkov.

KOREA 1950. By the Chief of Military History. 281 Pages. Superintendent of Documents, Government Printing Office, Washington, D. C. $1.25.

BY CAPT JOHN J. VALLASTER, JR., *Inf*

This book, dedicated to the American soldier and his comrades in arms, records by text and photographs the first 6 months of the Korean conflict. The first chapter gives a brief summary of the history of Korea and outlines the events that led up to the invasion of South Korea by the armed forces of North Korea. The other four chapters narrate the military action from the time the first few United States troops arrived in South Korea to help the Republic of Korea Army repel the North Koreans to 31 December 1950 when the troops of the United States and other United Nations regrouped south of the 38th Parallel for a new drive on the Communist forces.

The text of 48 pages deals mainly with over-all operations, giving fairly and impartially the military aspects and the consequences of the actions of the first 6 months. The volume deals principally with ground actions of the Army and Marines.

The outstanding feature of the volume is the 321 photographs which, with their captions, are a complete history in themselves. The pictures accurately reflect the human hardships and privations, difficulties of terrain, weather, communications, and refugees, which marked the early months of the conflict.

This book is an excellent reference volume for the student of the Korean conflict and an exceedingly good souvenir volume for the veteran of the conflict.

Subscriptions to the MILITARY REVIEW may be obtained by writing directly to the Editor, Military Review, Command and General Staff College, Fort Leavenworth, Kansas. In the following countries subscriptions will be accepted at the addresses listed below:

Argentina

Círculo Militar, Buenos Aires.

Bolivia

Director, "Revista Militar," La Paz.

Brazil

Biblioteca Militar, Ministério da Guerra, Rio de Janeiro.

Chile

Estado Mayor General del Ejército, Departamento de Informaciones, Santiago.

Colombia

Sección de Historia y Biblioteca del Estado Mayor General, Ministerio de Guerra, Bogotá.

Ecuador

Dirección de Publicaciones Militares del Estado Mayor General, Ministerio de Defensa, Quito.

El Salvador

Estado Mayor General de la Fuerza Armada, Departamento de Publicidad y Bibliografía, San Salvador.

Mexico

Escuela Superior de Guerra, Oficina de Divulgación Cultural Militar,
San Jerónimo Lídice, D. F.

Nicaragua

Dirección de la Academia Militar, Managua.

Peru

Air Forces

Ministerio de Aeronáutica, Academia de Guerra Aérea, Lima.

Ground Forces

Ministerio de Guerra, Servicio de Prensa, Propaganda y Publicaciones Militares, Lima.

Portugal

Revista Militar, Largo da Anunciada 9, Lisboa.

Uruguay

Biblioteca de la Inspección General del Ejército, Montevideo.

Venezuela

Negociado de Publicaciones de la 2ª Sección del Estado Mayor General, Ministerio de la Defensa Nacional, Caracas.

The Army Librarian
Room 1A 522, The Pentagon,
Washington 25, D.C. 6-53